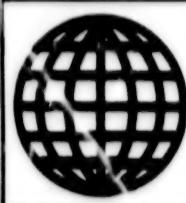


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9 May 1994



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Russian Academy of Sciences, Finance Ministry Negotiate Over Funding

947A0041A Moscow *POISK* in Russian No. 10 (252),
18-24 Mar 94 p 1

[Unsigned article: "Victory of an Outsider"]

[Text] "For the first time the Finance Ministry has taken a constructive stance in its interrelationships with the Academy," summed up Yu. Osipov, president of the Russian Academy of Sciences, of the negotiations with V. Petrov, Deputy Finance Minister. As a result of the negotiations the principal financial requirements of the Academy were satisfied.

To say that the government was in debt to the Russian Academy of Sciences means to say nothing at all. If the debts of the past year are broken down by items, these include both the "net" indebtedness and the nonallocation of sums for increasing wages in September and December, and inflationary losses due to the lag in the allocation of sums for the April, September, November and December indexings, and the incomplete cancellation of the increase in the cost of communal services. In the second quarter of last year the Russian Academy of Sciences with respect to the salary level struggled for the next to the last place among all the branches of the economy with cultural workers. At that time the physiological subsistence wage could not provide the necessities for a candidate of sciences and his children. The struggle of the outsiders did not end advantageously for the scientists, and in the second half of the year the Academy firmly occupied last place. In December a doctor of sciences, a professor, no longer could provide normal sustenance for himself and his children. According to calculations of the economic planning administration of the Russian Academy of Sciences, the arrears for the past year amounted to about 43 billion rubles. It was possible to win about 37 billion of these from the Finance Ministry; that is the sum which they promised to pay.

In the negotiations with the Finance Ministry it also was necessary to fight for the budget of the Russian Academy of Sciences for 1994. The Finance Ministry recently announced a 10% cutback for all budget applications. Yu. Osipov, president of the Russian Academy of Sciences, and V. Khlebodarov, president of the Trade Union of Workers of the Russian Academy of Sciences, were able to come to an agreement on the restoration of the initial figure—here an additional 57 billion was won back.

In general the agreement reached with V. Petrov was "stretched out" by almost 100 billion rubles. By the end of March the specialists of the Russian Academy of Sciences should be paid the salary arrears for the past year, and by mid-April—for the first quarter of this year.

The Trade Union of the Workers of the Russian Academy of Sciences, planning the picketing of the

Finance Ministry in the event of failure in the negotiations, called off the protest action. But, as the leaders of the trade union declare, it is, as before, in combat readiness—during the past year the government issued a stack of "money" decrees which it has systematically failed to abide by.

Incidentally, the mission of the trade unions in protecting the interests of the workers should be facilitated by issuance of an edict of the president of the Russian Federation entitled "Responsibility for Violation of Work Rules for Citizens," providing for bringing to account those guilty of failure to pay salaries on time. And nevertheless, despite the fact that it was possible to come to agreement on the return of an impressive sum of money, the leaders of the Academy trade union feel that the problems must be solved in principle at the political level. In their appeals to the government and president they insist that legislation be enacted fixing the percentage of the budget allocated for fundamental science in an amount not less than 4%, that it be included among the socially significant state expenditures, that laws be enacted defining the place of science in the state and that a clear strategy be formulated for the reform of science.

Duma Recommends More Money for Science

947A0041B Moscow *DELOVOY MIR* in Russian
19 Mar 94 p 1

[Article by Boris Krotkov, *DELOVOY MIR* political reviewer: "The Duma States: Today It's Also Rough for Science"]

[Text] On Friday the work of the State Duma seemingly consisted of two parts. A large part of the day it worked on its own business, discussing a draft of its Regulations—a document which defines the routine of its activity. When the Regulations are adopted as a whole, we will familiarize our readers with them, but now I want to report on one amendment whose adoption, in my opinion, characterizes the mood of the Duma majority. Reference is to Article 7, defining the procedures for depriving a deputy of his inviolability. Initially it was proposed that this be done by a simple majority of the total number of deputies. But an amendment was adopted under which the "majority" was replaced by "two thirds." Even the left radical S. Baburin was indignant at such a change. He declared that it was not good for legislators to put themselves in an exceptional position, but he could not change the minds of his colleagues. During the second half of the day the house switched to an examination of the problem of the situation in Russian science. It was acknowledged to be critical, bordering on catastrophic. In the draft of a decree prepared by three committees—on education, culture and science, on industry, construction, transportation and power production, and on economic policy—it was reported that many highly qualified scientists and young people are leaving science, laboratories are being

closed, research in the high-priority fields of mathematics, physics, chemistry, biology and the earth sciences is being reduced, and there has been a considerable reduction in the volume of research on the development of new equipment and technologies. The wages of scientists are considerably lower than the average for the country. For a resolution by the house there was a proposal to ask the government of the Russian Federation "to examine and solve the problem of increasing the percentage of budgeted funding of the fundamental and high-priority applied research at scientific institutions of the Russian Academy of Sciences, branch academies, universities and science centers of the country to 2% of the gross national product." And possibly this idea would have passed if it had not been for the intervention of the "Russia's Choice" party. It declared that it would be premature to require stipulation of a specific percentage of the gross national product prior to examination of the draft budget prepared by the government and its submission to the Duma. This level, in the opinion of Ye. Gaydar, can be achieved only after a simultaneous examination of the needs of the entire social sphere and the possibilities afforded by the income side of the budget. He proposed that the words "up to 2% of the gross national product" be replaced by the words "by means of reduction of expenditures on maintenance of the state bureaucracy and the scale of subventions to territories." In conclusion, one proposal will be mentioned which if it had passed could result in a renewal of the earlier confrontation between the parliament and the president. It was made by deputy A. Lukyanov, the former chairman of the Supreme Soviet of the Soviet Union, and it boiled down to this: include in the agenda the question: "Abrogation of the Decree of the RSFSR on Ratification of the Belovezh Agreements." This idea was rejected by only an insignificant majority of votes.

S&T Collective Prepares Report on Russian 'Brain Drain'

947A0041C Moscow DELOVOY MIR in Russian
27 Mar 94 p 5]

[Article by Yevgeniy Panov, DELOVOY MIR reviewer: "From the 20th Century—Into the 18th Century?"; the first two paragraphs are an introduction]

[Text] Two years ago, when the outflow of specialists from the spheres of science and education acquired a dangerous scale, the Russian National Committee on the "Brain Drain" Problem, organized under the aegis of the Russian Federation Commission on UNESCO Affairs, initiated the formulation of proposals on regulation of intellectual migration. It was intended that the document be delivered to the government, which on its basis could adopt a special program, that is, a package of interrelated decisions, making it possible to avert or at least reduce the threat of intellectual bleeding white of the country, forestalling a breakdown of the mechanisms for reproduction of its scientific-technological potential, making use of the emergence of Russia onto the world market of highly skilled labor in the national interest.

Now a report entitled "Brain Drain from Russia: Problems, Prospects, Approaches for Control" has been prepared by a large scientific team of several tens of persons and has been discussed in the Russian Federation Commission on UNESCO Affairs with the participation of the experts of that organization—scientists from Europe and the United States.

The experts agreed that the prospects for the next few years are gloomy, that Russian science stands on the threshold of irreversible decline and that its salvation dictates immediate, energetic, significant measures, but a list of possible actions is not to be found in the report. In their opinion the report combines the features of a detailed scientific analysis, a political manifesto and an appeal to the authorities. For the first, however, there is insufficient specific knowledge concerning the nature of the migration and statistics; the second raises the problem to an unjustifiably high level, ignoring the ordinary everyday reasons which are most frequently responsible for the "brain drain"; with respect to the third, the most important thing is not to address the politicians with messages warning of catastrophe, but to achieve solid state funding of science and education, and in far greater amounts than now. Today a little more than 1% of the Russian gross national product is being allocated for these purposes, which for the end of the 20th century is simply appalling—perhaps as much as was allocated at the end of the 18th century. Our history never has known of such a scornful attitude toward science and education.

The experts acknowledged that getting solid funding will be very difficult because the Russian government, like all governments in the world, "doesn't care one single bit about pure science." It is always difficult for scientists to explain things to politicians—the latter "do not speak in the language of logic, but in the language of authority." The experts therefore advised their Russian colleagues "not to entertain unrealistic expectations too much" and to try to do something actually extraordinary. For example, artificially accelerating the "brain drain" process or completely ending research in order to "force the politicians to their knees," or as a last recourse, "correctly sell the report to the government." That is, jack up the price. In response to this the Russian side noted that our government is not accustomed to haggling with its citizens—it is its custom to take what's free.

Advice of such a type scarcely suits our needs. However, the experts gave it from the best motivations. And they left, leaving us alone with a problem which while the discussions go on may disappear, if it has not already disappeared. The "brain drain" process, going through rises and falls, has apparently stabilized itself. He who could go abroad has already left; he who sought out a job in national commercial structures has already made his way there (the assumed relation between the first and second is 1:10). Apparently even if all those departing abroad or leaving for other jobs were forcefully returned to laboratories and university departments the problem of maintaining and developing Russian science would

not thereby be solved due to its specific characteristics and special aspects of the transitional situation.

First of all, Russian science was always state science. It was born of the needs of the state and was 99.9% funded by it, so far as it was needed by the state. Even in the first flourishing of Russian capitalism it was almost unsupported by the patrons of the arts and sciences.

Second, the state always required a militarized science. Ninety-five percent of the problems which it solved were defense problems, and in Soviet times these also were ideological.

Accordingly, being deprived of state support, science was helpless. And it was deprived of support because state orders for solution of defense and ideological problems amounted to virtually nothing. "Pure" science, however, fundamental research, does not fit into the traditional scheme. The authorities see no link between the funding of such research and the problems involved in survival of the state. The support of science is regarded by politicians to be more of a symbolic act, directed to the maintenance (for the sake of propriety) of some humanitarian decorum, some general cultural level of the nation, without which it would fall into savagery.

Alas, entrepreneurs have precisely the same attitude toward fundamental science: their direct business interests are not dependent on the advance of fundamental research. And, it goes without saying, society as a whole will not very soon mature to the understanding that "there is nothing more practical than a good theory." This means that in the immediate future science can count only on state support. Under one condition: if it is able to demonstrate to the authorities its urgent need for science, the key role of science in the modernization of society.

We agree with the UNESCO experts, it will be extremely difficult to do this. But even with a positive outcome it will be impossible to satisfy all the appetites. It must be recognized that the system of Soviet science—in its former structuring and in its earlier branching—no longer is being revived. And that's good. It is evident that the Russian science of tomorrow must not be a rerun of the Soviet science of yesterday. It is clear that a new generation of researchers must arrive, rapidly adapting themselves to the rapidly changing reality. It also is clear: among those who have remained in present-day Russian institutes, and these, we can call them, are organizations of the transitional period, have inadequately developed their capabilities for adaptation. But among those who have gone abroad these capabilities are not much better developed. The overwhelming majority of the fishers for scientific and everyday happiness are working there under contract, that is, as performers of tasks, for whom the position of independent researcher is unattainable. Our candidates of science in actuality are employed in America as laboratory assistants. Will they grow as scientists, especially under conditions of unusual technological excess? It is more likely that the reverse will happen, they will go downhill.

Thus, the situation in general is such that neither the restraining of the "drain" nor the return flow of minds can save Russian science. During the course of drawing up the program for the regulation of intellectual migration it came to be understood that this is not really the problem. The problem is the training of a qualitatively different body of specialists, the education of a new intellectual elite. And since without a strong stratum of intellectuals any country is doomed to backwardness, because in its absence there is no guarantee of the very safety of the country, the creation of conditions for the appearance and reproduction of the new elite would be a higher manifestation of state wisdom. In what specific way should it be expressed? In the support of education and science. In their solid funding. And not at the shameful level of the end of the 18th century, but at the level of the beginning of the 21st century.

CHEMISTRY

Crown Ether-Containing Styryl Dyes. Part 8. Cation-Dependent Coordinated [2 + 2]-Autophotocycloaddition of Betaines of Photochromic 15-Crown-5-Ethers

947M0063A Moscow *IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA* in Russian No. 8, Aug 93 (manuscript received 15 Oct 92) pp 1449-1452

[Article by M.V. Alfimov, S.P. Gromov, O.B. Stanislavskiy, Ye.N. Ushakov, and O.A. Fedorova, Chemical Physics Institute imeni N.N. Semenov, Russian Academy of Sciences, Moscow; UDC 541.143]

[Abstract] Coordinated reactions of $[2\pi+2\pi]$ -photocycloaddition involve a lower excited singlet state, and the stereochemistry of the primary product is determined with consideration of orbital symmetry or orbital overlapping. One promising strategy for controlling the $[2\pi+2\pi]$ -photocycloaddition of arylethylenes may be based on the principles of molecular self-organization. Spontaneous molecular self-organization is based on adding substituents to the reagent that will dictate the spontaneous assembly of the desired supramolecular system in the solution. This type of self-organization at the molecular level is interesting from the standpoint of creating photo-switched molecular devices. In a previously reported study, the following anion-“covered” crown ether-containing styryl dyes were synthesized and observed to undergo reversible *trans-cis*-photoisomerization: betaine 2-[2-(2,3,5,6,8,9,11,12-octahydro-1,4,7,10,13-benzopentaoxacyclopentadecin-16-yl)ethenyl]-3-(3-sulfopropyl)benzothiazolium and betaine 2-[2-(2,3,5,6,8,9,11,12-octahydro-1,4,7,10,13-benzopentaoxacyclopentadecin-16-yl)ethinyl]-3-(4-sulfobutyl)benzothiazolium. In a continuation of that line of research, styryl dyes containing a crown ether group and heteroaromatic residue with a sulfoalkyl N-substituent were subjected to photocyclodimerization in the presence of $Mg(ClO_4)_2$ in acetonitrile. When the 1×10^{-2} -M study solutions of magnesium complexes were irradiated with light at a wavelength of 436 nm, a new product formed. ^{13}C and 1H NMR spectroscopy, the double resonance method, and comparison with existing data on the PMR spectra of the starting alkenes and $[2+2]$ -cycloadducts based on diaryl- and arylhetarylethylenes and coumarin were used to establish the structure of the two photolysis products (with a type A structure): dibetaine 1, *cis*-3-di[3-sulfopropyl]benzothiazole-2-yl]-*trans*-4-di(2,3,5,6,8,9,11,12-octahydro-1,4,7,10,13-benzopentaoxacyclopentadecin-16-yl)cyclobutane and dibetaine 1, *cis*-3-di[3-sulfobutyl]benzothiazole-2-yl]-*trans*-4-di(2,3,5,6,8,9,11,12-octahydro-1,4,7,10,13-benzopentaoxacyclopentadecin-16-yl)cyclobutane. The regio- and stereoselectivity of the reaction was explained in terms of the self-organization of the *trans*-isomers of styryl dyes when they form complexes with Mg^{2+} cations and become dimers with a fixed relative location of their multiple bonds. Figures 2; references 14: 8 Russian, 6 Western.

MISCELLANEOUS

Reactivity of Complex

$[(\eta^5\text{-Cp})\text{V}(\mu^2\text{-}\eta^6\text{-}\eta^2\text{-C}_{10}\text{H}_8)\text{Yb}(\text{THF})(\mu^2\text{-}\eta^5\text{-}\eta^5\text{-Cp})]_n$

947M0063B Moscow *IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA* in Russian No. 8, Aug 93 (manuscript received 7 May 93) pp 1470-1472

[Article by I.L. Fedyushkin and M.N. Bochkarev, Organometallic Chemistry Institute, Russian Academy of Sciences, Nizhniy Novgorod; UDC 546.668:546.881:547.652]

[Abstract] The reactivity of the complex $\text{CpVC}_{10}\text{H}_8\text{Yb}(\text{THF})\text{Cp}$ with H_2O , CO , CO_2 , $\text{Cr}(\text{CO})_6$, CpTl , azobenzene, and other reagents was studied. When $\text{CpVC}_{10}\text{H}_8\text{Yb}(\text{THF})\text{Cp}$ was reacted with H_2O in an equimolar ratio in tetrahydrofuran, the result was $\text{CpYBOH}(\text{THF})_2$ and $\text{CpVC}_{10}\text{H}_8$. The reaction of $\text{CpVC}_{10}\text{H}_8\text{Yb}(\text{THF})\text{Cp}$ with CO and CO_2 resulted in Cp_2Yb , $\text{CpVC}_{10}\text{H}_8$, and insoluble carboxylates. Reacting $\text{CpVC}_{10}\text{H}_8\text{Yb}(\text{THF})\text{Cp}$ with an equimolar quantity of $\text{Cr}(\text{CO})_6$ results not only in breaking of the $\text{C}_{10}\text{H}_8\text{-Yb}$ bond but also in destruction of the $\text{CpVC}_{10}\text{H}_8$ fragment. As a result, the following compounds form: Cp_2Yb , Cp_2V , $\text{CpVC}_{10}\text{H}_8$, $\text{CpVC}_{10}\text{H}_8\text{VCp}$, and C_{10}H_8 . When $\text{CpVC}_{10}\text{H}_8\text{Yb}(\text{THF})\text{Cp}$ is reacted with CpTl under mild conditions, there is a good yield of Cp_2Yb and $\text{CpVC}_{10}\text{H}_8$. The reaction of $\text{CpVC}_{10}\text{H}_8\text{Yb}(\text{THF})\text{Cp}$ with azobenzene results in the diphenylhydrazine ytterbium complex $[\text{CpYb}(\text{THF})_2\text{Ph}_2\text{N}_2]_2$. The results of the aforementioned reactions thus confirmed that the most labile bond in the complex $\text{CpVC}_{10}\text{H}_8\text{Yb}(\text{THF})\text{Cp}$ is that between ytterbium and naphthalene and that the said bond breaks in all reactions involving the complex. References 9: 3 Russian, 6 Western.

Crystal and Molecular Structure of the Organosilicon Derivatives of Titanium (IV) $(\text{Me}_3\text{Si})_3\text{SiTi}(\text{NEt}_2)_3$ and $\text{CITi}[\text{N}(\text{SiMe}_3)_2]_3$

947M0063C Moscow *IZVESTIYA AKADEMII NAUK RAN SERIYA KHIMICHESKAYA* in Russian No. 8, Aug 93 (manuscript received 24 Oct 92; after revision 10 Apr 93) pp 1473-1476

[Article by Yu.E. Ovchinnikov, Yu.T. Struchkov, M.V. Ustinov, and M.G. Voronkov, Elementoorganic Compounds Institute imeni A.N. Nesmeyanov, Russian Academy of Sciences, and Irkutsk Organic Chemistry Institute, Siberian Department, Russian Academy of Sciences; UDC 548.737]

[Abstract] Because of the scarcity of literature regarding the structures of organometallic derivatives with Ti-Si and Ti-Ge bonds, samples of $(\text{Me}_3\text{Si})_3\text{SiTi}(\text{NEt}_2)_3$ and $\text{CITi}[\text{N}(\text{SiMe}_3)_2]_3$ were subjected to an x-ray crystallographic study on a Synthex P2₁ diffractometer while in evacuated Pyrex capillary tubes at 190 K and 200 K, respectively. The following values were determined for

$(Me_3Si)_3SiTi(NEt_2)_3$; $a = 11.744(2)$ angstroms; $b = 11.744(2)$ angstroms; $c = 46.732(8)$ angstroms; $\alpha = \beta = \gamma = 90^\circ$; $V = 6.445(3)$ cubic angstroms; $Z = 8$; $d_{\text{calc}} = 1.055$ g/cm³; spatial group = $P4_12_12$; and $R(R_w) = 0.038(0.038)$. The values determined for $CiTi[N(SiMe₃)₂]₃$ were as follows: $a = 111.838(2)$ angstroms; $b = 111.838(2)$ angstroms; $c = 111.838(2)$ angstroms; $\alpha = \beta = \gamma = 99.15(1)^\circ$; $V = 1.588(1)$ cubic angstroms; $Z = 2$; $d_{\text{calc}} = 1.295$ g/cm³; spatial group = $R\bar{3}c$; and $R(R_w) = 0.029(0.032)$. The molecule of $(Me_3Si)_3SiTi(NEt_2)_3$ has a crossed conformation (approximate intrinsic C₃ symmetry) and bond lengths as follows:

Ti-Si = 2.671(2) angstroms and Ti-N = 1.874-1.890(5) angstroms. The molecule of $CiTi[N(SiMe₃)₂]₃$ has exact C₃ symmetry. Its Ti-Cl bond is 2.260(1) angstroms long, and its Ti-N bond is 1.926(1) angstroms long. Strong distortions of the symmetry of the valence environment of the N atoms in both $(Me_3Si)_3SiTi(NEt_2)_3$ and $CiTi[N(SiMe₃)₂]₃$ and their related structures were observed and attributed to electronic effects that were in turn related to the conformations of the respective molecule fragments examined. Figures 2, tables 6; references 5: 2 Russian, 3 Western.

ANALYSIS, TREATMENT, MINING

Levels of Heavy Natural Radionuclides Contained in Dumps with Metallurgical Tailings in Urals in Urals

947D0016A Yekaterinburg DEFEKTOSKOPIYA
in Russian No. 3, Mar 93 (manuscr. received 9 Jul 91,
in final version 6 Feb 92) pp 76-78

[Article by Ye.N. Karavayeva, I.V. Molchanov, V.P. Guseva, N.I. Shekhurina, Ye.S. Korepanova, and A.I. Okunev, Institute of Plant and Animal Ecology at Russian Academy of Science, Urals Department; UDC 502.55(217.7)]

[Abstract] Metallurgical tailings in dumps of the Krasnoyarsk Copper Smelting Combine and of the Central Urals Copper Smelting Plant, both in the Sverdlovsk region, have been tested for levels of natural ^{238}U , ^{232}Th , and ^{226}Ra . Both enterprises are using apatites and phosphogypsum in their chemical cycles. In the Krasnoyarsk plant phosphogypsum is produced during extraction of phosphoric acid from raw material by means of sulfuric acid in the water rinse channel and from here it flows into the dump, the heap having since 1980 built up to a 5 m high one covering an area of 2 ha. For the Central Urals plant phosphogypsum in the form of homogeneous loose bulk is stored in a yard, the 5 m high layer covering an area of 150-200 ha. Samples of phosphogypsum were taken throughout August 1990, every day 0.5 kg large samples skimmed from the top and the slopes of each heap and then thoroughly mixed. After preliminary hermetization, the ^{226}Ra level was measured in an AMA-O2F1 multichannel analyzer with a NaI(Tl) scintillation detector. Both uranium and thorium levels were measured by the photocolorimetric method in an arseno-Sh reactor. The power of γ -radiation doses above the dumps and contiguous territories was measured with an SRP-68-01 scintillation survey radiometer. In the raw material the activity of ^{238}U , ^{232}Th , and ^{226}Ra was found not to exceed 50 Bq/kg, 27 Bq/kg, and 30 Bq/kg, respectively. These levels are comparable with their average levels in the surrounding environment. As the reference standard for structural materials in Russia is used the index $C_{\text{eff}} = C_{\text{Ra}} + 1.31C_{\text{Th}} + 0.086C_{\text{K}}$, (K- ^{40}K), which must not exceed 370 Bq/kg within residential areas, 740 Bq/kg on highways cutting through populated areas, and 1850 Bq/kg on highways connecting populated areas. Tables 2; references 10.

COMPOSITE MATERIALS

New Generation of Refractory Concretes. Colloidal Chemical Aspects of Their Technology

947D0014A Moscow OGNEUPORY in Russian No. 1, Jan 94 pp 4-12

[Article by Yu.Ye. Pivinskiy, "Intersil" Company; UDC 666.974.2: 66.043.1:541.18]

[Abstract] This is the last part of an article by the author (OGNEUPORY: Nos. 7-8, 1990; No. 12, 1990; Nos. 11-12, 1992; No. 3, 1993). In connection with development of new refractory concretes, not only low-cement grades but also ceramic and thixotropic ones, the role of colloidal chemistry along with acid-base interaction in the technology of these materials is reviewed from the standpoint of the DLFO [expansion not available] theory. Concretes are, in accordance with that theory, regarded as highly polydisperse systems with ultrahigh (80-90%) concentrations of the solid phase in water. First is considered the interaction of disperse particles and the aggregative stability of such a system, both involving attraction and coagulation forces such as the vander Waals-London force opposed by repulsion forces such as that due to superposition of electric double layers. Structurization of concrete is examined by considering clay and silica or quartz glass as binder in aqueous suspension with a generally variable pH. The rheology and the state of such a bidisperse system are examined considering that the liquid binder consists of free water (gravitational phase), osmotic water (transitional phase), adsorption water (strong molecular binding), and crystallization water. Considering that the mechanical properties as well as the electrokinetic behavior of the solid binder depend largely on the electrostatic forces in the system, data have been obtained indicating how both the tensile strength and the flexural strength of various air-dried oxides depend on the electrokinetic potential. Inasmuch as the performance of binders is to an exceptionally high degree influenced by their acidity-alkalinity balance, the ion potential index Z/r has been proposed as a measure of this state and then used for a comparative evaluation of various oxides suitable for refractory concretes. The review concludes with systems having a mixed solid phase and subject to heterocoagulation. Figures 12; references 26.

Rheology and Technology of Ceramics and Refractories. Premises and Models

947D0015A Moscow OGNEUPORY in Russian No. 3, Mar 94 pp 7-15

[Article by Yu.Ye. Pivinskiy, Belgorod Institute of Structural Materials Technology; UDC 532.135:666.76]

[Abstract] The rheology of ceramics and refractories is reviewed systematically as both a subject of mathematical physics and a theoretical basis for the technology of these materials, which belong in the class of polydisperse systems. The two key objects of rheology as a science are study of both the macrorheological characteristics aided by mathematical descriptions of the stress-strain (or strain rate) relation and study of the microrheological characteristics determined by the dependence of mechanical properties on the structure. As a framework for review and analysis of this subject are considered three axioms:

- Under uniform hydrostatic pressure all materials behave alike as ideal elastic bodies;

- Every material has all rheological properties, but each material has them in a characteristic of it quantitative relation which depends on its state as well on its loading history and on the ambient temperature;
- There exists a hierarchy of ideal bodies in terms of from the simplest one up to more and more complex ones, one, corresponding to the rheological behavior modes of real materials.

In accordance with the third axiom, the equation for a simpler body is obtained from the one for a complex body by setting appropriate constants to zero. These axioms are applied to analysis of the stressed-strained state, both elastic and plastic deformation being analyzed by using as example elastic and plastic prisms in shear. It is shown that slow deformation of polydisperse systems such as ceramics and refractories can result in either plastic or viscous flow, or of both modes of flow simultaneously. The three simple rheological models are ideal Hookean elastic body, an ideal St. Venant plastic body, and ideal Newtonian viscous fluid. The main complex rheological models are non-Newtonian and non-Hookean ones, all characterized by a nonlinear strain rate on stress dependence. They include reversible nonideal elastic deformation, elastoplastic irreversible nonideal deformation (Hookean body and St. Venant bodies in series), nonelasto-plastic nonideal deformation, elastoviscous Maxwell relaxation flow (Hookean body and Newtonian body in series), elastoviscous solid body (Kelvin body and Voigt body in parallel), viscoplastic Bingham body (Hookean body in series with St. Venant body and Newtonian body in parallel), viscoplastic Shvedov body (Hookean body in series with St. Venant body and Maxwell body in parallel), and dilatant Persoz body (viscous body and regulator in parallel followed by additional viscous body in series). The technology of ceramic and refractory materials with specified performance characteristics such as density and strength must take into account the rheological behavior of their components during successive stages of the manufacturing process. Figures 7; references 23.

Utilization of Tailings from Plasma Equipment for Production of Refractories

947D0015B Moscow OGNEUPORY in Russian No. 3, Mar 94 pp 16-17

[Article by G.P. Zhigalov and O.A. Kharchenko, Magnitogorsk Institute of Mining and Metallurgy; UDC 666.76.002.8]

[Abstract] Inasmuch as 15-20% of clay is known to turn into dust during its heat treatment for production of fireclay, recovery of that dust and its utilization is being considered and a centrifugal plasma apparatus for this purpose has been developed for this purpose at the Institute. The apparatus is a furnace, a lined cylindrical pot on a turntable and a removable dome-like cover. A hole through the center of the cover is provided for vertical downward insertion of an electrode and in the turntable is provided a coaxial tap hole under the electrode tip. An off-center second hole is there provided in the dome for feeding dust from a collector. The design of this furnace is based on a mathematical model describing three temperature-dependent processes: arc discharge, heat transfer within the active zone, and viscous melting of the descending film. The length of the arc was calculated in accordance with its electric circuit theory with inclusion of four empirical constants. The vertical distribution of the thermal flux in terms of the altitude-dependent heat reception function. The vertical distribution of the separation density of disperse material was calculated in terms of the altitude-dependent separation function. The rate of downward flow and the thickness of the film were calculated in accordance with laws of melt hydrodynamics in the presence of centrifugal forces. The applicable ordinary first-order differential equation of hydrodynamics was formulated according to V.D. Dunskiy (INZHENERNO-FIZICHESKIY ZHURNAL, Vol. 2 No. 9, 1959) for a film of melt on double-layer furnace lining, a plastic surface layer backing the film and an immovable rigid layer directly adjacent to the furnace wall. The difference between theoretical and experimental results did not exceed 15%. Figures 1; references 2.

U-70 Proton Synchrotron Profiled

947J0020A Moscow ROSSIYSKIYE VESTI in Russian
31 Mar 94 p 12

[Article by Gennadiy Dernovoy, Protvino: "Accelerator: Light at the End of the Tunnel?"]

[Text] In January of this year, after a half-year stoppage caused by the lack of funds for paying for electric power, which had gone up sharply in price, the U-70 proton synchrotron was again started up at the High Energy Physics Institute near Moscow. Comprehending the destructiveness of the stoppage of research in one of the few Russian fields which are competitive in the scientific world, the government of the Russian Federation, through the Ministry of Atomic Energy and the Ministry of Science and Technology, allocated the funds for carrying out a full operational run of the largest Russian accelerator. Not the last role, to be sure, was played by the stubbornness of the directors of the High Energy Physics Institute and the support of the scientific community.

And the accelerator went through the run with flying colors. More than 70% of the accelerator time was used directly in physical experiments.

But the principal event occurred at the end of the run when the physicists had completed the intended program and were afforded the opportunity to work as real accelerator specialists. For the first time a beam of high-energy (up to 3^{11} protons in a "packet") protons was sent through an injection channel into the ring of a

new accelerator constructed here—the so-called acceleration-accumulation complex (UNK—uskoritelno-nakopitelnyy kompleks). The tunnel, 21 kilometers long already, is virtually finished and the electrophysical equipment for the "filling" of the tunnel also for the most part has been fabricated. The new accelerator is 15 times "longer" than that now in operation but will be able to impart a hundred times more energy to the accelerated particles and this will afford possibilities for major research and discoveries. But for the transfer of proton plasmoids from the "small" accelerator into the underground "large" accelerator there has to be an injection channel with a length of 2 $\frac{1}{2}$ kilometers.

Thus, on 13 March the physical startup of an important component of the UNK—the injection channel—took place. This was a great success for the staff of scientists, engineers, technicians, and workers of the High Energy Physics Institute, builders and assemblers. But the success, it goes without saying, is interim, because the startup of the entire accelerator will be more complex. The most important thing today is that despite everything Russian physics lives on and is developing. So enough of the argument popular two decades ago: who is more important—"physicists" or "poets"? Neither of these turned out to be the victor, but instead the resourceful businessmen, mercilessly exploiting human vices and weaknesses: drinking, smoking, etc. The work of Protvino physicists, now receiving a wage two or three times less than those serving them, gives basis for assuming that this long-standing dispute may very well be raised again after several years.

Development of Fast Stable Computer Image Reconstruction Methods in Digital Acoustic Holography

947G0022A Kiev ELEKTRONNOYE
MODELIROVANIYE in Russian No. 5, Sep-Oct 93
pp 67-73

[Article by Corresponding Member, AN Ukrayiny [Academy of Sciences of Ukraine] Viktor Fedorovich Yevdokimov, Candidate of Technical Sciences Aleksandr Stepanovich Ogor and Engineer Sergey Vladimirovich Mesyats (Problems of Simulation in the Power Industry Institute, AN Ukrayiny, Kiev) under the "Application of Simulation Methods and Means in Science, Technology and National Economy" rubric; received 01-27-93; UDC 534.8:534.7.4]

[Abstract] An image reconstruction method based on "raster" representations of the object and hologram is described. The method consists of the following computation procedures: A one-dimensional hologram is multiplied by a function that is a complex conjugate of a one-dimensional hologram of a point object. A transition from a function that has been corrected using a linear frequency (LF) demodulation procedure is performed. Using the LF demodulation method and Fourier transform one obtains a reconstructed image of the object function. Processes of image reconstruction from an acoustic hologram using the LF demodulation method and Fourier transform are illustrated by results of a simulation process consisting of synthesis of a raster Fresnel phase hologram from the original image and reconstruction by means of computer realization of computational procedures. The new computational method for computer reconstruction of images from holographic descriptions of objects (quasi-holograms) in a Fresnel zone is advantageous in terms of the scope of computations and insensitive to measurement errors and computing procedures noise. Figures 6, references 8: 7 Russian, 1 Western.

Development of Mathematical Models, Methodology and Software for Calculation of Thermal Fields of Reactor Shut Down for Repair

947G0022B Kiev ELEKTRONNOYE
MODELIROVANIYE in Russian No. 5, Sep-Oct 93
pp 62-66

[Article by Candidates of Technical Sciences N.P. Ivanenko and L.G. Kirillova, Engineer A.P. Ivanenko, Scientific Associate V.I. Spilnyy (Energy Conservation Problems Institute, AN Ukrayiny, Kiev) and Candidate of Physical Mathematical Sciences O.G. Chernikov (Leningrad AES, St. Petersburg, Russia) under the "Systemic Studies and Simulation in Power Engineering"; received 11-17-92, received after rework 2-4-93; UDC 621.039.5]

[Abstract] A set of algorithms and programs were developed at the Energy Conservation Problems Institute, AN Ukrayiny, that make it possible to conduct computer experiments studying the process of reactor cooling in modes of natural and forced circulation of the heat transfer agent and determine the time it takes to reach critical temperature values in the interrupted natural circulation of the heat transfer agent mode and technological channel dewatering mode. To study reactor core cooling processes and certain repair work it is feasible to use mathematical simulation of thermal fields in the reactor. The authors propose a software complex that makes it possible to conduct studies in a core subregion that has the shape of a rectangle with the perimeter not exceeding 40 blocks. An algorithm for step-by-step calculation of graphite brickwork and all technological channels in the subregion was developed. The developed method for two-stage simulation of a two-dimensional problem in a Cartesian coordinate system for graphite brickwork and two-dimensional axially symmetric problem in a cylindrical coordinate system for computational analysis of all technological channels in a subregion made it possible to perform numeric realization of the mathematical model on an AT/XT PC. The simulation process is described. The proposed model, methodology and software make it possible to obtain information on temperature values in various core components with a fairly high degree of discretization. The use of the described software complex will make it possible to perform numerical simulation of cooling processes and repair work in the RBMK-1000 reactor core. Figures 3, references 3.

Optimization of Matrix-Addressed Control of Spatial Light Modulators Based on Viscoelastic Deformed Media. Part 1

947K0070A Novosibirsk AVTOMETRIYA in Russian
No. 6, Nov-Dec 93 /manuscript submitted 24 Dec 92/
pp 14-24

[Article by N. B. Kuleshov, I. V. Tokarev, Kiev, Ukraine;
UDC 535.241.13:534]

[Abstract] Spatial light modulators are the key element in systems for the optical processing of information and in light-valve projection displays. At present, the most common means of controlling spatial light modulators is the active matrix. One of the most important advantages offered by such control is the ability to maintain a constant controlling electric field. This paper presents a numerical/analytical technique for calculating the distribution of electric fields in a matrix-addressed spatial-light-modulator structure; the technique can be used to optimize electrode-raster parameters. The researchers perform a comparative analysis of common modulators based on viscoelastic structures and matrix-addressed modulators and study air-gap-controlled modulators. They analyze six common modulator designs for which the optimal correlations have been obtained between the width of the conducting portion of the electrode raster and its cycling period, as well as between the cycling period and the thickness of the viscoelastic deformed layer. Figures 6, references 15: 7 Russian, 8 Western.

In Situ Ellipsometric Profiling of Optical Constants of Heterostructures

947K0070B Novosibirsk AVTOMETRIYA in Russian
No. 6, Nov-Dec 93 /manuscript submitted 20 May 93/
pp 25-33

[Article by V. A. Shvetsov; UDC 535.51]

[Abstract] Measurements performed with computerized ellipsometry during the process associated with the formation of a semiconductor or dielectric layer make it possible to achieve a virtually constant relationship between the ellipsometric parameters ψ and δ , on the one hand, and time, on the other. Most often, a model of one or two homogenous structures is used to interpret such dependences. If, however, a structure *a fortiori* heterogeneous in thickness is formed, such models cannot be used; the relationships of the optical constants—the refractive index $n(z)$ and the absorption index $k(z)$ (z being the coordinate along the normal to the surface)—need to be determined. If ψ and δ as a function of z are known, determining such relationships is not difficult. In experimental conditions, however, ψ and δ are a function of time, and their relationship to z is not known. The researchers here examine the possibility of retrieving profiles of $n(z)$ and $k(z)$ from the experimental curves $\psi(t)$ and $\delta(t)$, where t is time or any other parameter with no clear connection to z . They construct an algorithm that enables profiling of the constants for heterostructures with small gradients. No data on the

thickness of the growing structure is required. Figures 6, references 10: 4 Russian, 6 Western.

Aspects of the Development of Multicontact Fiber-Optic Connectors

947K0070C Novosibirsk AVTOMETRIYA in Russian
No. 6, Nov-Dec 93 /manuscript submitted 24 Dec 92/
pp 34-38

[Article by A. A. Berbovetskiy, I. A. Shilov; UDC 681.327:681.7]

[Abstract] The development of fiber-optic transmission systems has led to the need for multicontact fiber-optic connectors. For various reasons, however, most of the connectors that have been proposed can connect only 2-10 fibers and cannot accommodate much plugging and unplugging. The researchers here suggest alternative connectors whose design and production features enable the linkup of 1,000-10,000 fibers—a capability that makes them useful in computer systems, fiber-optic communication systems, and integrated optical systems. The connectors have either guide pins or guide plates. Those with guide pins function in a temperature range of -30°-70°C and can withstand relative humidity of 90 percent. They can be easily assembled into multiconnector units. Figures 3, references 10: 8 Russian, 2 Western.

Nonlinear Regularizing Algorithm for Retrieving Pulse Signals

947K0070D Novosibirsk AVTOMETRIYA in Russian
No. 6, Nov-Dec 93 /manuscript submitted 24 Mar 93/
pp 71-78

[Article by Yu. Ye. Voskoboinikov, Novosibirsk; UDC 535.81.01]

[Abstract] Linear regularizing algorithms do not produce acceptable solutions for certain classes of signals $\phi(y)$ (the width of which is severalfold smaller than the width of the nucleus $k(x)$). In spectroscopic measurements, for example, the sought-for solution takes the form of narrow pulses, with short intervals of nonzero values alternating with continuous intervals of zero values. Such "pulse" signals have a broad energy spectrum that, after passage through an instrument with a limited pass band, is transformed into a low-frequency spectrum—the $f(x)$ signal no longer contains high-frequency components of the function $\phi(y)$. Linear algorithms cannot retrieve such signals properly. That prompted the researchers here to expand on earlier work (A. V. Bronnikov et al., "Nonlinear Regularizing Algorithm of Reduction for an Ideal Instrument," *OPTIKA I SPEKTROSKOPIYA*, 1988, Vol. 64, No. 4; Yu. Ye. Voskoboinikov, "Solution of Inverse Measurement Problems on Convex Functions Sets," *AVTOMETRIYA*, 1990, No. 1) and set forth an effective nonlinear regularizing algorithm for solving a first-order pulse-function integral equation on the basis of

iterative supplementation of the definition for the hf components of the solution of $\phi(y)$. References 10: 8 Russian, 2 Western.

Automated Interpretation of Aerospace Images. Part 1

947K0070E Novosibirsk AVTOMETRIYA in Russian
No. 6, Nov-Dec 93 [manuscript submitted 11 Mar 93]
pp 79-83

[Article by F. S. Krasnova, V. B. Fofanov, Kazan; UDC 519.681]

[Abstract] The work reported here is a summary of the authors' work and work published in various sources regarding the automation of the interpretation of images. Interpreting is defined as the identification of a locale's mobile objects from aerospace images made of the locale. After defining the concept of the informational content of a set of characteristics mathematically, the researchers study the effect produced on the interpreting results by the number of characteristics used and by the different methods of breaking the sets of objects into classes. References 3 (Russian).

Study of an Algorithm for Detecting Objects on a Multizonal Image

947K0070F Novosibirsk AVTOMETRIYA in Russian
No. 6, Nov-Dec 93 [manuscript submitted 26 Jan 93]
pp 84-87

[Article by G. I. Peretyagin, Novosibirsk; UDC 519.67:629.78]

[Abstract] Interpretation, which includes searching out and detecting given objects, is the most complex component of the automated processing of images. A method is examined here for the design of a matched filter that detects objects of varying brightness on a multizonal image. The optimal detection of objects on a multizonal image consists of the following stages: calculation of autocorrelation and cross-correlation functions of the backgrounds of the initial components of the image; the construction of matched-filter-detector nuclei; filtration of images of spectral zones by given nuclei; summation of echoes from all spectral zones; selection of local extrema and decision-making regarding the matchup of extrema magnitudes and object echoes. When a statistical criterion that ensures the detection of an unknown number of objects is being designed, the last stage requires information on the behavior of filtered variables on the so-called tails of their joint distribution. References 4 (Russian).

Algorithms for Isolating Moving Objects on Images Via Use of the Kho Conversion

947K0070G Novosibirsk AVTOMETRIYA in Russian
No. 6, Nov-Dec 93 [manuscript submitted 28 Oct 92]
pp 88-93

[Article by Ye. P. Putyatin, V. A. Gorokhovstskiy, S. V. Ishchenko, Kharkov; UDC 681.322.05:007.52]

[Abstract] One common solution to the problem of isolating an object against a given background is to convert the image to a set of local characteristics for small sectors of the image. That provides better protection against local noise than does an approach that uses correlational algorithms, and it makes it possible to compress information and consider structural properties. Kho conversion algorithms, a class of structural algorithms, were used here to isolate objects and compute the parameters for conversions of objects on the basis of a set of local characteristics. They are designed for rapid localization of small objects and provide protection against local noise. Isolation of the object's points and evaluation of parameters are performed simultaneously. An integral description is not constructed with these algorithms, and the speed of the algorithms is faster than that with correlational algorithms. The Kho conversion algorithms can be adapted to existing a priori information about the object and distortions. References 4 (Russian).

Stochastic Model of Multibeam Radio Channel Between Moving Objects

947K0076A Kiev ELEKTRONNOYE
MODELIROVANIYE in Russian No. 5, Sep-Oct 93
pp 35-40

[Article by Doctor of Physical Mathematical Sciences Roman Vladimirovich Boyko (Mathematics Institute, AN Ukrayiny [Academy of Sciences of Ukraine], Kiev), Candidate of Technical Sciences Mikhail Ivanovich Lukhanin (Committee for Scientific Research and Experimental Design Work, Defense Ministry of Ukraine, Kiev) and Candidate of Technical Sciences Viktor Fedorovich Yerokhin (Kiev Military Management and Communications Institute, Ukraine); received May 18, 1992; UDC 621.931.81]

[Abstract] The article proposes a mathematical model of a multibeam radio channel between two objects moving over a random terrain. The model takes into account the effect of interference fading of detected signals. A case of objects moving along parallel headings, at distance s between them, at the same velocity and in the same direction is examined. The model assumes uniform terrain and building character. When the objects are moving, a receiver input can detect reflected signals in addition to the direct signal. The number of the reflected signals is random, and their distribution depends on the terrain and building type, as well as on the distance between the transmitter and receiver, the frequency of the transmitted signal, the height of the transmitting and

receiving antennas and reflecting properties of the underlying surface. The random process that describes the change of the number of reflected signals at the input of a receiver is a homogeneous random Markovian process with continuous time that takes integer values. Figures 1, references 2

Algorithm for Realization of Operation of Module Multiplication in System of Residual Classes

94K0076B Kiev ELEKTRONNOYE
MODELIROVANIYE in Russian No. 5, Sep-Oct 93
pp 20-26

[Article by Doctor of Technical Sciences Viktor Anatolievich Krasnobayev and Candidate of Technical Sciences Valeriy Petrovich Irkhin (Kharkov Military University, Ukraine); received Aug 11, 1992; UDC 681.142]

[Abstract] To improve the reliability and increase the speed of computers it is necessary to develop methods and algorithms for realization of arithmetic operations in the system of residual classes (SRC) with n bases that is based on the ring bias principle (RBP). A drawback of an algorithm for realization of an operation of module multiplication that was developed earlier is a relatively large size of the arithmetic and logical unit of a computer. The article examines a different algorithm. The use of the ring bias principle makes it possible to reduce the time of realization of the module operation of arithmetic multiplication. Schematic diagrams of computer arithmetic logical units in RBP based SRCs are shown. The RBP has another remarkable feature that makes it possible to improve the validity of calculations by using the error checks and corrections method. The validity of computer calculations is improved in the case of both unitary and binary coding. Figures 4, tables 4, references 7.

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AGRICULTURAL SCIENCE

Cotton Tissue Culture. Report 1. Callusogenesis in the Genus *Gossypium*

947C0216A Dushanbe *IZVESTIYA AKADEMII NAUK TADZHIKSKOY SSR: OTDELENIYE BIOLOGICHESKIKH NAUK* in Russian No. 1, 1991 pp 19-23

[Article by N. S. Koroleva and O. Kh. Yuldashev, Institute of Plant Physiology and Biophysics of the Tadzhik SSR Academy of Sciences; UDC 581.143.6]

[Abstract] The dependence of cotton callusogenesis on plant genotype, explant type and physiological state, and growing conditions was studied. Seeds from a number of different genotypes were delinted, cleaned, placed on a semi-solid agar substrate, and cultivated at 28 to 30°C in 5,000 to 7,000 lx of illumination with a 16:8 photoperiod ratio. When the cotyledons of the seedlings had opened, cuttings 2 to 3 mm in length were taken from the hypocotyls and the roots, and cuttings 5 mm in length were taken from the leaves. The cuttings were cultivated in the same medium and under the same conditions as the seeds. It was found that the type and physiological condition of the explant greatly affected callus formation. Regardless of genotype, hypocotyl cuttings yielded the best results, and root cuttings the poorest. The position of the explant on the parent plant might have a significant effect on the successful cultivation of a callus culture, which does depend on the position of the explant on the substrate. Callus tissue will form in either light or darkness, but illumination levels between 5,000 to 7,000 lx produced the best results, especially with the hypocotyl explants. Low (2,000 lx) or very high (10,000 lx) illumination levels had a deleterious effect on callus formation. The optimal temperature was 28 +/-2°C; temperatures between 20 to 24°C resulted in increased necrosis and weaker proliferation. A number of different growing media were tested, and two of these, both based on the T. Murashige/F. Skoog medium and differing primarily in their thiamine with HCl concentration and phytohormone composition, provided the most satisfactory results. Tables 5; references 13: 1 Russian, 12 Western.

BIOTECHNOLOGY

Vityaz Bay Military Marine Mammals Program

947C0172A Moscow *KOMSOMOLSKAYA PRAVDA* in Russian 1 Dec 93 p 2

[Article by Natalya Barabash: "Strategic Dolphins of Vityaz Bay: Rather Than Sinking the Enemy, They're Biting Their Own"]

[Text] SIXTY YEARS AGO, on the central beach of Vladivostok, a sea lion suddenly appeared. The cute whiskered animal first splashed around near some bathers, and then casually clambered aboard a yacht for

a pleasant nap. Naturally reporter-photographers immediately flocked to the dock, while scientists came bearing nets, with which they embarked upon trapping the marine visitor, to the delight of the vacationers.

In the morning all of the newspapers carried a picture of the photogenic sea lion, with commentary. Ecologists angrily wrote about disturbance of the marine ecosystem. Ichthyologists warned that soon all of the starving animals whose fish had been fished out would be coming to us for food. Biologists asserted that the sick and weakened animal simply confused the beach for a sealing ground.

Then suddenly the newspapers fell silent, as if by command.

In the meantime the events developed in the spirit of a spy film. Under the cover of night, a boatload of humorless characters rode up to the scientists who had trapped the animal. They gave a stern lecture to the biologists who allowed reporters to photograph the "object," and made them promise not to disclose this military secret. And then, despite the stormy weather, they hastily loaded the "object" into the boat and carried it away. The beach bum turned out to be the famous Grom, a SCUBA diver hunter that had escaped for the umpteenth time from the supersecret military dolphinarium in Vityaz Bay.

Once upon a time, peaceful scientists settled down in Vityaz and set up shop. Then the military appeared in the bay. They erected their temporary buildings, began showing interest in the dolphinarium created by the oceanologists, and like in the tale of the fox and the hare, chased the scientists out, with strategic necessity as their excuse (as a result of which the naval nomenklatura took over all of the other coziest inlets of Maritime Kray, where they now vacation with their families).

But the dolphinarium is a special facility. The clever animals are equated here in secrecy to something close to nuclear warheads, but their use for military purposes is denied in every way. Consequently when some friends of mine asked me if I wanted to get a look at Grom himself, I instantly agreed.

Spies mustn't read any further, please. First we took a boat as far as the town of Slavyanka, from where we hitched a ride in an ordinary (not military) car almost up to forbidden Vityaz, after which we hiked around 20 minutes on a trail leading from the road to the bay. Not once during this time were we confronted by an armed guard, and no one shouted "Halt! Who goes there?" ("So many vacationers come here from the city in summer that they'd get tired of yelling at us!" my friends explained.).

A good road skirting the bay leads directly to the secret dolphinarium. Then it disappears behind barbed wire. But don't despair. Taking a few steps to the left (or the right, either way), you'll surely come across a large hole. Crawl through, and watch....

The huge shape of grom noisily splashed and snorted in the fenced pool, while restless Margo tested the corners with her curious nose for the thousandth time, searching for even the slightest possibility of another escape. White whales—there were four of them at the time of our visit—are kept separated from the sea lions, because cantankerous Margo keeps trying to pick a fight with them. The dolphinarium also housed two common seals working in the same program as the sea lions, two fur seals (they've already been hauled off to Sevastopol), and a grey seal nicknamed "Man in a Gas Mask."

In the evening, at tea, my friends and their buddies—the trainers—told stories about the antics of their pupils, and about the local "terrible secrets."

Here are the secrets: The military dolphinarium was established in the early 1980s, after the Soviet command was inspired by the successes of marine animals in protecting Soviet bases in Viet Nam. They say that the Sevastopol-trained bottlenose dolphins that were paired up with sea lions there worked fabulously. Mobile, and possessing fabulous echolocation, the good-natured dolphins patrolled the territory, and when they detected a SCUBA diver, they activated a radio beacon with their snouts. It was then that a killer sea lion with a dart secured to him was dispatched to the particular quadrant to get the SCUBA diver.

In Maritime Kray they decided to adhere to the same training principles. Of course, they replaced the expensive bottlenose dolphins by the modest Far Eastern white whales, and sea lions by common seals and fur seals. Because this was in the good old days when the state never skimped on resources for military purposes, and the military had little concern for the environment, the animals were trapped for Vityaz by the hundreds. As for how many of them died, we don't know—nowhere else in the world were such barbaric trapping methods (the trapping was done by a scientific subdivision of the Pacific Ocean Scientific Research Institute of Fisheries and Oceanography on the basis of an agreement with the command) and such terrible transportation conditions to be found. If two of 10 injured, tormented white whales survived in the dolphinarium, this was thought to be an accomplishment. Once 20 fur seals were brought in together, and in a few days they all died. There was no way the hired trainers could make the command understand that the animals required adaptation, special medicines, and special food. The answer they got was always the same—just do it!

It was only after the flow of money from state subsidies dried up that the military moderated their mass conscription of white whales into the army, organized a veterinary service and established proper feeding.

This is why only Grom and Margo are the only old-timers left at Vityaz, and even they have a lot to be angry at people for. Grom, for example, when he was small, simply wandered around the military post. And the young soldiers—good for you, sports!—had their kind of

fun with him: They put their cigarettes out on his hide or stuck them in his flippers, and kicked the sea lion.

Little Grom dreamed up ways of taking revenge upon his tormentors. And now this hulk of a creature, weighing close to a ton, runs away from the dolphinarium at the first opportunity, and then races madly about the bay, aiming at all the people with the hope of biting somebody. He escapes because of lax supervision by the military unit's keepers. A year ago for example, Grom and Margo pushed the trainer's stand (no one enters the cage without it) over to the feeder with their snouts, climbed up on its roof, made their way to a ladder standing beside a launch, and got over to the shore from there. As always, Grom set out upon a pogrom against the personnel, while Margo, who despises white whales, followed her nose out to sea. A boat, a launch, and a catamaran were lowered into the water. They spent half of the night searching for her.

These minor incidents, as well as the summer visits by the command, spice up life at the military dolphinarium. Otherwise there's nothing to say about any great or serious results of its work. In the opinion of the trainers the entire program is better suited to a circus than war.

Judge for yourself. The animal training process is long and hard. First the animals are taught to respond to a whistle. Then they assimilate a circus program—as training for the animals and as entertainment for military inspectors. And only after many months of lessons are the dolphins taught to detect SCUBA divers in water, while sea lions and fur seals that are delivered right to the "saboteur" are taught to push him up to the surface with all of their might. The animals aren't forced to plant mines on ships, thank God, although they can recognize foreign objects on a hull. But in general, an ordinary SCUBA diver can do this also.

And so, after almost 10 years of the dolphinarium's existence, its accomplishments, which were demonstrated a year ago in a Far Eastern exercise, are as follows: White whales in cages (they still can't risk releasing them from the cages) are taken out to sea. There, upon hearing the noise of a moving SCUBA diver, they press a button installed in the cage to activate a radio signal. In response to the signal a sea lion descends, but only on a leash (the leash is secured to a horse-type harness on its back). This tethered sea lion then pushes the unlucky SCUBA diver up to the surface. And woe be upon the divers if it's Margo's turn to train with them. She aims right for the family jewels, such that the cursing of the "saboteurs" is audible even through their face masks as they shoot almost a meter up out of the water.

Even if we allow that this threat to their manhood would scare off actual spies, this could hardly be recognized as the most reliable means of protecting military facilities. All the more so because the world rejected the use of marine animals for military purposes long ago. In part

due to a love of nature, and in part due to the unjustifiably high costs. Maintaining the dolphinarium in Vityaz obviously costs a lot of money. Just building the training cages cost several million rubles way back when. And then there's the cost of maintaining the open-air cages, catching the fish and trapping the animals, the expensive training at sea, and the wages for the trainers and keepers.

In short, even the military themselves at one time began talking about transferring the dolphinarium to civilian hands. However, it was probably a pity to lose such a fabulous vacation spot. In any case Pacific Fleet commander G. Gurinov responded to my questions that being a special facility, the dolphinarium is under Moscow's jurisdiction, which meant that the issue had to be resolved there.

And in the meantime life goes on at the "special facility." In summer, they are barely able to accommodate all of the staff officers coming in for inspections. And in winter, when they are cut off from the world, they sit around and drink bitters.

By the way, for the benefit of especially inquisitive spies, let me say that all of the military secrets described here have long been known to all inhabitants of Khasanskiy Rayon (the collectives of some enterprises come for tours of the dolphinarium), and to many foreigners who are invited by the military from time to time to Vityaz Bay for a weekend.

Role of Membrane Lipids in Regulation of Functioning of Receptors of Neurotransmitters

947C0193A Moscow BIORHIMIYA in Russian Vol. 58 No. 11, Nov 1993 [manuscript submitted 15 Dec 92; after revision 12 Jun 93] pp 1685-1708

[Article by O. S. Belokoneva, S. V. Zaytsev, Institute of Physicochemical Biology imeni A. N. Belozerskiy, MGU imeni M. V. Lomonosov; UDC 577.352]

[Abstract] The role of membrane lipids is examined in the context of the interaction between neurotransmitters and membrane-bound receptors. The researchers focus on the specificity of the interaction of the lipids and the neuro-transmitter molecules and on the modulation of the receptor binding activity by annular lipids and the physical state of the lipid bilayer. Special attention is devoted to lipid regulation of the binding of ligands and opioid receptors. The researchers use the system of opioid receptors to describe the application of a new approach to the study of lipid regulation of receptors. The approach involves an integrated study of the kinetics of the spontaneous inactivation of the binding of selective ligands in the presence of membranotropic substances and the kinetics of the variation in the viscosity of the lipid bilayer and lipid peroxidation. The process of inactivation of membrane-bound opioid receptors is apparently fully determined by the variations that occur in the physicochemical properties of the membrane lipids in the process of incubation. The

researchers also address a system for the stabilization of the binding of opioid receptors. They note, however, that a number of effects remained unexplained, to wit, that of the structural order of the biological membrane, surface charge, elastic properties, permeability, and phase state. Figures 2, references 107: 13 Russian, 94 Western.

Steady-State Kinetics of the Functioning of Amperometric Bienzymatic Sensors Effecting Cyclical Substrate Conversions

947C0193B Moscow BIORHIMIYA in Russian Vol. 58 No. 11, Nov 1993 [manuscript submitted 25 Nov 92] pp 1729-1741

[Article by V. V. Sorochinskiy, B. I. Kurganov, Institute of Biochemistry imeni A. N. Bakh, Russian Academy of Sciences, Moscow; UDC 577.151.01]

[Abstract] A theoretical analysis is performed for the steady-state kinetics of the functioning of amperometric bienzymatic sensors in whose covering the substrate being determined undergoes cyclical conversion. The researchers assume that the enzyme reactions obey Michaelis-Menten kinetics and that the substrate and intermediate concentrations are evenly distributed in the enzyme layer. The relationships between the magnitude of the steady-state response and the concentration of the substrate in solution are determined for instances in which one of the products of the regeneration of the substrate or intermediate is the detected depolarizer, as are the ranges of allowable values for the thickness and the diffusion-catalytic characteristics of the biosensor cover components. The researchers consider two biosensors: in one, a depolarizer product P that is detectable on the indicator electrode is formed during the reverse process catalyzed by the E_2 immobilized enzyme; in the other, the depolarizer comes about in the reaction involving the E_1 enzyme. Figures 4, references 5: 2 Russian, 3 Western.

BIOTECHNOLOGY

Recovery and Properties of Gold-Transforming Au-Protein of *Micrococcus luteus*

947C0151A Moscow DOKLADY AKADEMII NAUK in Russian Vol. 333 No. 3, Nov 93 (manuscript received 03 Aug 93) pp 392-394

[Article by L.A. Levchenko, N.V. Lariontseva, A.P. Ssakov, Institute of Chemical Physics, Russian Academy of Sciences, Chernogolovka, Moscow Oblast; UDC 577.152.1]

[Abstract] A gold-containing protein (Au-protein)complex was isolated from *Micrococcus luteus* by conventional recovery methods. Au-protein was shown to be a 600 kD membrane-bound complex representing about 12% of total membrane proteins and containing 3 Au atoms. Adsorption spectroscopy (390, 425,

450 and 480 nm peaks) and extraction techniques demonstrated the presence of 1.0 moles of flavin and 3-5 moles of carotene moieties per mole of Au-protein, as well as 6 SH groups. The Au-protein was shown to be an NADH oxidase with Au in the active site. Figures 1; tables 1; references 3: 2 Russian, 1 Western.

Antigenicity of Synthetic Peptide Fragments of Hepatitis C Virus

947C0154B Moscow *DOKLADY AKADEMII NAUK* in Russian Vol. 333 No. 3, Nov 93 (manuscript received 30 Jul 93) pp 395-397

[Article by Yu.A. Semiletov, T.V. Firsova, S.N. Kuzin, V.A. Shibnev and S.O. Vyazov, Scientific Research Institute of Virology imeni D.I. Ivanovskiy, Russian Academy of Medical Sciences, Moscow; UDC 577.6:578.891.083.3]

[Abstract] Synthetic peptides fragments representing hepatitis virus C (HVC) proteins were tested for reactivity with antisera obtained from acute and chronic cases of HVC disease. The results were also compared with commercial recombinants antigens c22, c33c, c100 and 5-1-1 (RIBA-II, Chiron Corp., USA). The study showed that the 1274-1280 sequence of the nonstructural NS3 protein appears to be an immunodominant epitope. In addition, fragment 1931-1940 of NS4 was also identified as the immunodominant site. Finally, high immunoreactivity was also displayed by fragment 20-34 of the core protein. Finally, reactivity of peptides 1689-1707 and 1713-1731 paralleled that of 5-1-1, providing further support for the view that both N- and C-termini of the 5-1-1 antigen have diagnostic significance. These observations demonstrate that synthetic peptides corresponding to the core, NS3 and NS4 proteins may have promise as diagnostic reagents for HVC infections. Figures 1; tables 1; references 13: 2 Russian, 11 Western.

Using Biogenic Surfactants in Microbiological Cleansing of Petroleum Hydrocarbons From Soil

947C0209A Moscow *MIKROBIOLOGICHESKIY ZHURNAL* in Russian Vol. 55 No. 1, Jan-Feb 93 (manuscript received 16 Mar 92) pp 75-77

[Article by M.V. Moskovchenko, Ye.V. Stabnikov, V.N. Ivanov, and I.A. Panzhda, Kiev Food Industry Technology Institute, and Microbiology and Virology Institute, Ukraine Academy of Sciences, Kiev; UDC 579.64:631.46]

[Abstract] A method has been developed for in situ remediation of oil-contaminated soil. The new method is based on the use of a biofoam that has a biodegradable surfactant as its main component. A microbial biomass, i.e., activated sludge containing 1.9 percent dry matter from cleaning equipment and molasses served as raw materials for the new foams. The biosurfactant from the

activated sludge (biosurfactant 1) was produced by alkaline hydrolysis at a temperature of 21-28°C for 20 hours with a 5-7 percent KOH solution followed by orthophosphoric acid neutralization. The molasses biosurfactant (biosurfactant 2) was produced by flotation treatment of a molasses solution with a concentration of 12 percent dry matter at pH 5. The foam fraction extracted off amounted to 5 percent of the solution volume. The flotation treatment was conducted with a minimum airflow by pumping the molasses solution into the flotation machine at a rate of 100 ml/min. A 2 percent solution of activated sludge biosurfactant (biosurfactant 1) was found to have a surface tension of 57.17 mN/m, foaming ability of 80 ml, and emulsifying activity of 51.8 percent. The molasses biosurfactant (biosurfactant 2) did not possess any emulsifying activity, had a surface tension of 47.48 mN/m, and a foaming ability of 80 ml (calculated for a 0.25 percent solution). Both biosurfactants were found to be biologically mild surfactants. The effectiveness of the new biosurfactants' ability to purify oil-contaminated soils was determined on samples of loamy soil that had been contaminated by oil in amounts of 18,200 to 20,500 mg/kg. The decontamination process was conducted at room temperature by periodically breaking up the soil and adding a *Bacillus megaterium*-based microbial preparation to it once a week. The microbial preparation was added to the soil samples in three ways: in a water suspension, in a biofoam obtained from a suspension containing 50 g/l microbial preparation and 1.25 g/l biosurfactant 2, and in a biofoam obtained from a suspension containing 50 g/l microbial preparation and 1.25 g/l biosurfactant 1. After 35 days, 89 percent of the hydrocarbons had been removed from the soils treated with the microbial preparation and biosurfactants, whereas only 26.2 percent of the hydrocarbons had been removed from the soil samples treated with the microbial preparation and water. Laboratory tests further established that the initial rate of hydrocarbon consumption by the destructive microorganisms was 1.7 time higher when the biosurfactants were present than when they were not. The activated sludge biosurfactant had a chemical oxygen demand [COD] of 188 O₂/g, biochemical oxygen demand (calculated on day 5) [BOD₅] of 72 mg O₂/g, and BOD₅/COD of 38 percent, whereas the molasses biosurfactant had a COD of 517 O₂/g, BOD₅ of 228 mg O₂/g, and BOD₅/COD of 44 percent. Tables 2; references 14: 10 Russian; 4 Western.

Russia Tries To Cope With Donor Blood Shortages

947C0268A Moscow *MOSKOVSKAYA PRAVDA* in Russian 13-20 Mar 94 p B8

[Article by A. Losoto, "Russia Suffering From Blood Shortage".]

[Text] There is a shortage of donor blood in Moscow. A few days ago the Moscow Red Cross appealed to Muscovites to immediately come to the municipal blood donor station or participate in blood donor drives organized at their places of employment. The cost of 100 ml

of blood is 3,000 rubles. The use of disposable blood collection systems is guaranteed everywhere.

In the USSR for the past many years unpaid donors have replenished the blood supplies. I remember as an institute student standing in line for up to three hours, waiting to be pricked in the cubital vein, given a free meal, and freed from my hated studies for a couple of days. Such remuneration seemed if not royal, at least quite acceptable.

But nowadays society's attitude has given way to indifference. They no longer visit the blood donor stations. Won't a free lunch entice anyone today? There is also another subtle difference: whereas in earlier days donors were morally encouraged to donate and were given time off to do so, now there are fewer bosses who welcome the "whims" of their subordinates. And finally, people are afraid that they will contract AIDS. Even though the medics use only disposable systems, the people have no faith in them.

Today only the most extraordinary, tragic events, such as we witnessed last fall, can move the people to a massive donation of blood. Thank God there was no shortage of donors then.

But we cannot use the prepared blood. The methods of testing it are becoming more stringent—the dictates of our time. Besides tests for syphilis, AIDS, and hepatitis-B, in 1994 we began mandatory testing for antibodies to hepatitis-C, which according to some data, affects more than 10 million persons in Russia. A barrier to the spread of the infection was erected at the Moscow blood donor station back in March 1993, when they began testing for the virus long before the issuance of the order from the Russian Federation Ministry of Health. The promptitude is of course commendable, but 2 percent of the donors were virus carriers, and their blood had to be rejected.

The volunteers are not our only donors. Corpses also "give" blood. Upon sudden death from, for example, a heart attack, substances hindering blood coagulation are injected into the blood stream. This phenomenon is called fibrinolysis. There are laboratories that wash the blood from corpses in many of the major cities of Russia. The Moscow laboratory at the Emergency Medicine Scientific Research Institute imeni Sklifosovskiy prepares approximately one ton of such blood each year. According to current regulations, the relatives of the departed know nothing of this manipulation. The patient who has received this assistance also knows nothing more. Without touching on the ethical side of this issue, I will note that they transfuse blood from corpses only in our country.

Here nothing is allowed to go to waste. Besides corpse blood, they also collect placental blood, which they take from healthy new mothers. And then there is scrap blood, which is obtained from therapeutic blood lettings, which is used on a limited basis. In any case, medicine

goes forth; it was medics in the time of Tsar Gorokh who treated all diseases by blood-letting...

Nevertheless, natural donor blood remains the best and cannot be duplicated. For many years scientists have tried to create artificial blood. But I am afraid it would be foolish to await its soon advent. Better than that is the confirmation—the story of "blue blood", perfotran, which was developed at the Pushchino Biology Center of the Russian Academy of Sciences several years ago. It was used to save many Afghan soldiers, but pseudo-scientific squabbles resulted in scientists being accused of experiments on humans, and criminal proceedings began. One of the researchers committed suicide... Of course, at that time perfotran was far from perfect, but the priority of the USSR was clear. Today we have lost it.

As before, physicians are using only blood-substituting fluids that were developed long ago, fluids such as polyglucine and rheopolyglucine. They can help support hemodynamics and respiration, but unfortunately, they cannot carry oxygen.

In the meantime the Americans, in their many studies duplicating the Pushchino researchers, have surpassed us. Incidentally, there in America more and more people are opting to create a supply of their own blood, so that in case surgery is necessary, they can avoid the use of foreign blood. The American Red Cross has developed, and judging by everything, has been successful in implementing a huge campaign to promote self-donation. The most ardent supporters of self-donation are the well-to-do Americans. In the meantime physicians have begun to fear that in attempting to create a blood supply exclusively for themselves, people will stop giving it to others.

EPIDEMIOLOGY, MICROBIOLOGY, AND VIROLOGY

Causes of Growth in Incidence of Pertussis and Forecast for Next Few Years

947C01604 Moscow ZDRAVOKHRANENIYE
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[Text]Maximum reduction in incidence of childhood infections and their eradication are the end goal of all epidemic-control work have always been related to the expectation of mass use of active immunization. But thus far, full suppression of the epidemiological process and eradication of infection by means of preventive vaccines on the global scale have been achieved only for smallpox (1977). Success became possible thanks to

development of long-term strong postvaccinal immunity of the people in all countries in the absence of latent forms of disease.

In 1983, at a session of the European Region Office of WHO, the goal of good health for all by the year 2000 was formulated for European countries. As it relates to communicable diseases, by the year 2000 there are five diseases that must not exist in Europe: local measles, poliomyelitis, neonatal tetanus, congenital rubella and diphtheria. There was no discussion of diseases such as pertussis and meningococcal infection. Yet, vaccines against them have been developed, and these diseases could be classified as potentially controllable infections. What is the matter?

In the pre-inoculation period, the incidence of pertussis in the nation as a whole constituted 360-390 per 100,000 population, reaching higher figures in years of periodic rise. About 80 percent of all those stricken were children up to 5 years old. A high incidence of infections was consistently noted in children's institutions and schools: diseases were recorded in 98 percent of the creches, 78 percent of the nursery schools and 73 percent of the schools. Mortality reached 0.37 percent, and it was particularly high among infants up to 1 year old.

The incidence of pertussis was also high in other countries. Prior to the practice of vaccination, the highest morbidity rate was noted in Denmark, reaching rises to 1735-1849 per 100,000 population; in 1953, it constituted 771 in Finland, 380 in England and 60-79/100,000 in the United States. Even in those years, the incidence of pertussis was rather low in a number of countries (Mexico, Turkey, Japan, Iran, Italy, and others), and this was related to the lack of keeping records of pertussis due to poor medical care of the public.

Mass preventive vaccination against pertussis began to be practiced in our health care system and most other countries in the late 1950s and early 1960s, i.e., more than 30 years ago. At first, monovalent vaccines was used, and later associated ones—DPT and ADPT. Coverage with inoculations of children up to 5 years old increased consistently and reached 99.8 percent in 1964 (data for Moscow).

Analysis of incidence of pertussis in RSFSR revealed that it declined to one-half in 1961-1962, as compared to 1959. In subsequent years there was further decline in morbidity and it reached 49/100,000 population by 1967-1968. Since 1970, while the mean republic indicator was 16.9, there were already regions where only isolated cases of pertussis were reported. The clinical course became milder, fatalities became rare, and the mortality rate showed a 3.1-fold decline.

An analogous situation developed in other countries as well. For example, in the United States, immunization of children against pertussis began to be practiced extensively in 1943-1945. By 1950, the morbidity indicator already dropped to 79.8, it constituted 9.5 in 1962, 1.1 in 1974, and 0.47 in 1976. In England, immunizations were

started in 1951, with an indicator of 385. It dropped to 41.1 in 1962, 32.2 in 1963, and 4.9 in 1964. In Japan, inoculations were started in 1948. In 1963, the morbidity rate dropped to 1/32 of the 1950 figure (4.1/100,000 population).

The data of Russian and foreign authors indicate that pertussis control is successful with the use of specific preventive agents. The opinion was voiced that it would be possible to lower the incidence of pertussis in our country to isolated cases by 1970-1971, and to eradicate pertussis provided there was 90 percent coverage of children up to 5 years old with inoculations [2].

But it was subsequently learned that the pertussis vaccine has only a limited effect on the epidemic process; this was manifested by insufficient strength and duration of postvaccinal immunity and deficiencies in the system of using inoculations [1, 3-5].

In the 1970s, morbidity became stabilized at a relatively low level (5.8-10.8-11.7) in the RSFSR, but there was still a contrast in level of recorded morbidity. In some instances, the lack of records on pertussis cases in several territories of Russia was evaluated as eradication of pertussis.

In the last 10 years (from 1981-1982 to the present), the rise in incidence of pertussis that had started in Russia led to its generalized spread. At the present time, the morbidity level is 1.5-2 times higher than the 1970s level. The indicators of morbidity in years of periodic rises, which are recorded every 2-3 years and have become more pronounced, reached maximum levels in the late 20 years 15.1 (1982), 28.7 (1985), 23.5 (1988), and 28.8 (1991). The annual number of new cases exceeds 20,000-30,000. In the last 4 years, the morbidity rate was on the level of 10-30/100,000 in 50 percent of all krais and oblasts of Russia.

In addition to periodicity of rises in morbidity, it is also seasonal. Manifestation of this typical feature in the epidemic process of pertussis is demonstrable in regions where its detection and registration are best. The highest morbidity is recorded in the fall and winter, elevation begins in July-August and it is lowest in the spring and summer.

The number of new cases increases primarily among the urban population; in the 1980s, urban morbidity was 4-5 times higher than in rural areas: 21.0-25.8 versus 5.4-6.8 in 1990 and 1991, in 1990-1991, the highest morbidity was noted in St. Petersburg (75.2-80.9), Moscow (63.8-69.0), Novosibirsk (39.1-62.0) and Nizhniy Novgorod (20.55-49.1) oblasts.

This disease strikes mainly children up to the age of 14 years; among them the morbidity rate constituted 74.7-88.9 for the last 2 years. Most often, pertussis is recorded among infants, up to the age of 1-2 years, and the morbidity rate for them averages 154.7-136.1, reaching 200-600 or more per 100,000 children of this age group in some regions, and particularly urban areas. For

example, in 1989-1990, the lowest recorded morbidity indicators (to 50) among children up to 2 years old were found in only 9-13 oblasts (Rostov, Tomsk, Amur, Kamchatka, Buryatia, Checheno-Ingushetia and others), and the very lowest indicator (5.8) in 1989 was found in Buryatia. The indicators are in the range of 500-100 in 18-26 oblasts, with a larger share of oblasts with high morbidity levels: 38 territories in 1989 and 42 in 1990. The highest morbidity (200 to 600 or more) in the last 4 years has been noted in St. Petersburg, Moscow, Ivanovo, Novgorod, Orlov, Nizhniy Novgorod, Ryazan, Voronezh, Astrakhan, Novosibirsk oblasts, Altay and Stavropol krays, in Tataria, Mari Oll and Chuvashia.

The chief cause of rise in incidence of pertussis is, no doubt, the reduction in the immune stratum among children. Already in 1970-1972, a decline began in coverage of children with inoculations. The number of those inoculated dropped first of all because of the increase in number of children with medical objection to inoculations from 8.4 in 1969 to 41 in 1976. According to official statistics, coverage with pertussis inoculations was very low in RSFSR in 1988. It is only in 26.6 percent of the territories that the number of inoculated infants 1 year old constituted 81-90 percent. Over 28.3 percent of the territories, coverage with inoculations of children of this age does not exceed 60 percent. Among 3-year old children, this indicator constituted 81-90 percent in 30 percent of the territories, and it is considerably lower in the rest. There are territories where only 28-35 percent of the children 1-3 years old were inoculated. In the last 2 years (1990- 1991), 65 percent or more of the children were inoculated only in 49.4 percent of the territories, whereas the same figure for revaccination of children 3 years old applies to 58.2 percent of the territories. As compared to 1988, in 1990 the share of inoculated year-old infants dropped from 64.7 to 58.7 percent, and that of 3-year children, from 74.6 to 62.7 percent. The number of oblasts with very low inoculation coverage is growing: the share of inoculated children 1-3 years old constituted only 25-32 percent in St. Petersburg, Maritime Kray, Murmansk and Lipetsk oblasts, Tataria and the Gorno-Altay Republic.

A comparison of morbidity rate and inoculation indicators in recent years clearly shows that they are interrelated. We previously demonstrated a trend toward increase in share of uninoculated children among the new pertussis cases in the 1980s, as compared to the 1970s: from 25 to 65-70 percent [6, 7]. It persists to this day. Expressly the continuing decline in number of children inoculated against pertussis is the chief cause of rise in morbidity over most territories of our country. While the highest morbidity rate was found for Moscow for the past 10-15 years, which was attributable to the low coverage with vaccinations and better clinical and laboratory diagnostication [6, 7], in the last 2 years St. Petersburg has advanced to first place in Russia morbidity rate, and it has the lowest share of children inoculated against pertussis: only 25.2 percent were vaccinated and 28.4 percent were revaccinated.

The decline in severity of pertussis and associated lethality in the 1970s causes pediatricians to give it dramatically less attention. The significant difference between morbidity rates of different territories could be indicative not only of difference in specific immunity, but also of quality of detection. It was learned that the level of bacteriological detection is extremely low in most territories and, in spite of this, the diagnosis is established primarily on the basis of detection of the pathogen. Even in Moscow, where detection is better on the whole, the diagnosis of pertussis is made on the basis of clinical symptoms alone in only 22.4 percent of the cases. Moreover, analysis of clinical diagnostication in somatic hospitals revealed that, in some cities, the share of pertussis cases referred to them constitutes 19-45 percent or more. In addition, pertussis is recorded exclusively for infants up to 1 year old in most territories, and this is also indicative of a low level of clinical detection of pertussis in older children and adults, in whom the disease is milder.

Poor detection is attributable to incomplete and, as a rule, late performance of bacteriological tests for pertussis among the sick. There is virtually no screening of patient contacts in children's preschool institutions and schools, as well as of those who have a protracted (for more than 5-7 days) cough for the purpose of early detection of the sick. For this reason, demonstration of pertussis and parapertussis bacteria in culture is poor everywhere. In the 1980s, 40- 46 percent of all instances of isolating a culture of pertussis bacteria in Russian laboratories were carried out in Moscow.

Many years of epidemiological surveillance of pertussis in Moscow make it possible to predict the epidemic situation. Thus, as far back as 1984, we demonstrated that the retarding effect of specific prophylaxis on the epidemic process weakens due to the increase in number of uninoculated children; we need urgent steps to reduce their number, otherwise it is possible that more severe symptomatology of pertussis and intensification of the epidemic process will recur [5, 7, 8]. Unfortunately, the prediction came true: at the present time, we have an adverse epidemic situation for pertussis in Russia.

In the presence of the attenuated effect of specific prophylaxis, there have been changes in the symptomatology of the disease: it is more manifest—i.e., there is an increase in number of infants 4-12 months old with moderately severe forms of pertussis and in number of children over 1 year old at sites of infection with typical forms of the disease (from 65.4 to 83.6 percent). As in preceding years, there is prevalence of mild forms of pertussis among children over 1 year old, and the moderately severe form is encountered more often among those who were not inoculated than in those who were.

The 3-8-fold increase in number of children in preschool children's institutions and schools who are not vaccinated has led to a growth in sites of infection: 5 to 12 cases recorded in 50 percent of such sites.

Increased toxicity of strains of *Hemophilus pertussis* bacteria isolated from patients is particularly alarming. While there is predominant circulation of serotype 1.0.3, there has been a rise from 55.6 to 80 percent in share of moderately toxic strains. In recent years, highly toxic strains, which appeared in 7.4 percent of the cases in the early 1980s, are still being isolated in 5.7-11.1 percent of the cases. As compared to the toxicity of strains isolated in the 1970s, the toxicity of those isolated from patients in 1982-1988 has increased and now equals the toxicity of strains isolated in the 1960s. We related the increased toxicity to the continuing trend toward reducing the number of inoculated children, which has become particularly marked in the last 3-4 years due to negative information about vaccination in the press, radio and television.

Thus, the decrease in number of children inoculated against pertussis in recent years has led to rise in incidence of pertussis and its spread everywhere. There has been an increase in manifest nature of infection and toxicity of the pathogen, which renders the forecast concerning pertussis for the next few years unfavorable. We believe that, in such a situation, we need first of all some urgent steps to augment the immune stratum among children up to 3 years old. Unfortunately, neither rescheduling of ADPT vaccination to the age of 3 months, instead of 5-6 months, in 1980 nor its replacement in 1989 with the less reactogenic ADPT-M vaccine have led to an increase in number of children inoculated against pertussis.

We believe that we can obtain a decline in pertussis morbidity only by increasing coverage of children with inoculations, taking as the mandatory minimum 50 percent coverage of infants up to 1 year old with complete vaccination.

It is indisputable that adoption of a new vaccine, less reactogenic than ADPT, would be a cardinal solution to the pertussis problem. Development of such agents, so-called "acellular vaccines," is in progress in our country (Ufa Research Institute of Vaccines and Sera, Moscow Research Institute of Vaccines and Sera imeni I. I. Mechnikov) and abroad (United States, Japan, England, France, FRG) for more than 20 years already. However, to date, these vaccines did not gain broad use in health care practice. In both our country and abroad, ADPT vaccine is being used as yet, and it is only in Japan that children are immunized against pertussis with an acellular vaccine since 1981.

At the present time, the quality and standard uniformity of ADPT vaccine produced in our country improved: in 1980-1985, 80 percent of its series conformed to WHO specifications for toxicity indicators. While the goal for science today is to complete with dispatch research on development of new immunogenic and less reactogenic pertussis vaccines, the immediate task for health care practice is to exercise an individual approach to immunizing children, which would permit reduction in

number of unwarranted objections to pertussis vaccination and increase the coverage of children with inoculations.

Legislation adopted in 1991, which makes it mandatory to administer vaccines against six infections, including pertussis, must first of all assist pediatricians in revising their attitude toward inoculations and increase their responsibility for timely and mandatory protection of children against these infections.

In order to determine the causes of low vaccination coverage and search for ways to increase it in the first year of life, we developed a method for the health care system of carrying out ongoing analysis in each pediatric district of the status of immunization of children against pertussis, diphtheria, tetanus and measles.

Analysis is being made of timeliness of vaccination, with determination of causes for delaying its start, lack of vaccination, justification for prescribing ADP-M anatoxin instead of ADPT vaccine, medical objections, and determination of term of deferral of vaccination.

Experience with this method makes it possible to find 8 to 13 percent of the children who were not immunized on time for unwarranted medical objections and 5-8 percent of those who were not immunized due to organizational problems. Prompt elimination of the causes of delay and failure to immunize children increases coverage with inoculations by 13-20 percent among infants up to 1 year old.

Unquestionably epidemiological surveillance of pertussis infection, which includes analysis of morbidity rate (retrospective and current), analysis of immunization status, carrying out thorough, earlier and fuller clinical and epidemiological observations at sites of infection, dynamic investigation of properties of circulating strains of the pathogen of pertussis, makes it possible to predict the situation. But, a new, safer vaccine and methods of defining immunity available to the broad medical community, which permit evaluation of the immunological structure of the child population, are definitely needed for complete control of the epidemic process.

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Tactics for Control of Measles

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[Text]The acuity of the problem of measles control at the present time is determined by the epidemic situation in each individual territory of the RF [Russian Federation], extent of impact of specific preventive measures on the epidemic process, and solution of the cardinal problem, that of eliminating measles infection in the European region by 1995-2000, in accordance with the decision of the regional European Office of WHO (1984).

Theoretically, elimination of measles, which is construed as exclusion of epidemiologically interrelated measles cases in different large territories, is feasible. However, as shown by experience of developed countries that have a stable and highly immunogenic live measles vaccine (LMV) (United States, Sweden, Finland, and others), the measles virus still circulates readily in groups that are mostly inoculated, in spite of extensive immunization of children. Determination of the causes of this phenomenon is still one of the priority directions of modern science [3, 6].

Development of our own LMV [ZhKV] L-16 and a method of specific prophylaxis is a brilliant achievement of Russian scientific teams. The dynamics of measles became regressive under the effect of specific preventive measures. While maximum morbidity rate constituted 171-297 per 100,000 population in the first decade

(1970s) with extensive LMV immunization of children, in the 1980s it was 84-130 with periodic rises in morbidity. The particularly low morbidity rate, 12.4-17.3, was recorded in 1989-1991, which had been atypical previously in RF territories, as was extension of the period between epidemics to 6 years.

Improvement of the inoculation schedule (vaccination of children upon reaching the age of 1 year and revaccination at the age of 6-7 years before beginning school) was instrumental in the dramatic decline of measles in Russia. Moreover, adoption by health care institutions of a scientifically validated system of epidemiological surveillance of measles infection, which made it possible to implement timely additional measures in regions with a measles problem, had a substantial impact on the measles epidemic process. As a result, low morbidity rates are presently recorded in most regions of Russia, less than 10/100,000 population; mortality and lethality of measles infection have been virtually eradicated.

At the same time, the results of epidemiological surveillance indicate that implementation of the program for elimination of measles in the RF is encountering considerable difficulties, which are related to the quality of the vaccine used (nonstandard production series of LMV L-16), unsatisfactory organization of immunizations that do not provide full coverage of children of the specified age, as well as social and ecological distinctions inherent in different parts of Russia. There are still regions where the incidence of measles is extremely high, more than 100/100,000 (Penza, Tambov, Pskov oblasts and others).

In addition, a trend is observed everywhere toward increase in number of recorded measles cases among older individuals (15 years and older), as well as infants under 1 year old. Local outbreaks of measles occur, mainly in newly formed school groups, as well as in secondary and higher educational institutions and military units [2, 5].

The epidemic situation that exists today shows that preservation of a stable low level of measles morbidity in the RF (less than 20/100,000 population) is not a simple task, especially since the problem is made considerably more complicated by social and ecological problems that have appeared in our country.

All of the foregoing makes it imperative to further examine advances in measles control and improvement of the system of epidemiological surveillance of this infection.

Many years of epidemiological surveillance of measles dynamics in different parts of the RF differing in demographic, social, ecological conditions and quality of medical care revealed a pattern: activation of the measles epidemiological process, manifested by periodic rise in morbidity and manifestation of epidemicity, seasonal occurrence and existence of sites of infection, occurred wherever more than 20 percent of the child population was susceptible to measles.

Since there is a close correlation for measles between morbidity indicators and size of the immune stratum of children, the main task, performance of which results in epidemic welfare, is a high coverage (more than 90 percent) of children up to 2 years old with LMV vaccination, as well as a high degree of protection of children over 7 years old (no more than 7 percent seronegative). These indicators are generally considered as the main criteria determining the measles epidemic situation. On their basis, as well as with consideration of the morbidity rate, a differentiated approach is recommended to implementation of the set of preventive and epidemic-control measures.

Thus, in regions where the morbidity rate is under 10/100,000, there is more than 90 percent coverage of children up to 2 years old with inoculations, and the number of seronegative individuals does not exceed 7 percent, the measures can be reduced to maintaining wide coverage of children up to 2 years old with vaccinations and immediate work at sites of infection.

In cities and regions where the morbidity rate ranges from 10 to 20/100,000 population, vaccination coverage of children up to 2 years old constitutes 70-85 percent and is not stable, whereas among those over 7 years old more than 7 percent are seronegative, in addition to the above measures it is necessary to submit children and adolescents in the 3 indicator groups (3-4, 9-10, 16-17 years) to serological testing every 3 years, followed by immunization of seronegative children 6-7 years old prior to starting school. If the morbidity rate is higher, the range of measures is expanded, mainly to include steps aimed at enhancing immunity to measles in high risk and newly formed groups.

It has been shown on the example of Moscow Oblast that such a differentiated approach to instituted measures, which have been carried out for the last 5 years, provided a decline to one-half in morbidity rate and reduction to one-ninth in number of territories with a measles problem [1].

It should be stressed that rather favorable findings were made in assessing the efficacy of LMV revaccination of children 6-7 years of age as a mass measures. In recent years, the overall morbidity rate for measles declined by a mean of 1.7 times in the RF territories studied, mainly because of lower morbidity in the 7-10-year groups who were revaccinated with LMV. Over the 4-year observation period, there was not a single recorded case of measles among revaccinated children, and this confirms the high epidemiological efficacy of this measure [2].

At the same time, it must be borne in mind that, according to the results of serological screening, which was carried out during the revaccination period, there is a definite tendency toward increase in the group of children who are seronegative for the measles virus (on the average from 8.3 to 17.9 percent 1 and 4 years after revaccination, respectively). A high initial level of antibodies to measles virus hemolysin, as well as acute

respiratory viral infection within 3 months after revaccination or a history of various allergies requiring individualized preparation of the children for immunization, had an adverse effect on establishment and maintenance of immunity to measles of revaccinated children [4].

The findings enable us to assume that LMV revaccination of children before enrolling in school cannot provide persistent epidemic welfare and further adjustment will be required in specific preventive measures to provide effective control of measles. In addition, the scientific developments of recent years confirm the desirability of LMV revaccination with use of the serological PAT [passive hemagglutination test], i.e., only for seronegative individuals. This approach not only permits omitting unwarranted LMV revaccination of children protected against measles, but also reduces considerable expenditures for this expensive and scarce vaccine.

Although we consider revaccination to be a temporary measure for elimination of vaccination flaws, we believe that, in order to stabilize the measles morbidity rate in the RF at a low level (less than 10/100,000), the main thing is to achieve a high coverage (at least 90 percent) of children up to 2 years old with LMV vaccination and proper immunization with individualized approach to children in the risk groups. This has been confirmed by the latest data of WHO (1989), according to which there is no need for revaccination, which is temporarily practiced in a number of countries to correct measles immunity of the public, upon reaching a large stratum of children up to 2 years old that are immune to measles.

In addition to the foregoing, it is necessary to promptly arrest outbreaks of measles that occur in immune groups. It should be borne in mind that, in recent years, under the effect of LMV revaccination of children 6-7 years old, there has been a significant decrease in number of measles infection sites in the lowest school grades. In instances when measles has been brought into first to third grades, further spread of the infection is not usually observed. Sites with numerous measles cases are recorded mainly among higher grade pupils, as well as vocational and technical schools and other secondary and higher educational institutions. An insufficient actual stratum immune to measles, which fluctuates over a significant range, from 70 to 98 percent, is the chief cause of intense spread of measles in adolescent and adult groups, while the coverage of adolescents 15-17 years of age is usually high, according to medical records, and is close to 100 percent.

At the same time, observations of measles sites established that the intensity of its spread in groups depends, first of all, on the actual stratum immune to measles among contacts of sick individuals, and this can be assessed only on the basis of results of serological testing.

If the PAT shows that the level of group immunity to measles is less than 90 percent, the incidence of measles

at a site constitutes 10-13 per 100 contacts of measles patients. In groups with a higher level of protection against measles (91-96 percent immune), morbidity does not exceed 3-4 percent.

How long a measles patient remains in a group, duration and severity of his catarrhal symptoms that are instrumental in droplet transmission of the pathogen, plays a rather important part in the spread of measles infection. It was found that when the source of infection was part of the group for a short time, no more than 2 days, and in the absence of catarrhal symptoms of disease during this time, no spread of infection is observed, regardless of size of the immune stratum among his contacts. These findings, which indicate that there is a possibility that the term of infectivity of a measles victim has changed under present conditions, make it necessary to further accumulate data in this direction.

It should be noted that when exposure to measles extends to 3-4 days of the prodromal period, spread of infection is not prevented even when 95 percent of the individuals are immune to measles. At such sites, measles morbidity constitutes a mean of 5.7 per 100 contacts with the sick individual, and if the immune stratum is lower (71-80 percent) it constitutes 10.1 percent.

With longer exposure (for 3-4 days of the prodromal period, first day of eruption) of the group to the first measles victim, in the presence of catarrhal symptoms of the disease, there is usually subsequent spread of infection. Measles morbidity in such sites averages 6.1 per 100 contacts with the measles case, and the intensity of spread of infection in sites where there is long-term exposure of a group to the first measles victim is related to some extent to the actual level of the stratum immune to measles. As the number of measles-protected individuals increases from 80 to 96 percent, the morbidity rate drops from 13 to 3 percent. If the PAT shows that there are 97 percent seropositive individuals at the site, only isolated cases of measles are recorded, without further spread of infection.

The data obtained at infection sites enabled us to conclude that 97 percent individuals who are seropositive according to the PAT should be considered the "threshold" level of the stratum immune to measles, which prevents epidemic spread of infection in the group.

In addition, it has been shown that, when working in measles infection sites at the present time, there is increase in the role of clinical observations, which should be directed not only toward early detection of measles cases, but determination of the form of measles in a patient and severity of his catarrhal symptoms of the disease. These data are essential to determination of the scope of preventive and epidemic-control measures carried out among contacts of the measles patient, as well as forecasting the morbidity rate.

In assessing the efficacy of the set of preventive and epidemic-control steps taken at the present time to eradicate measles outbreaks, it should be noted that a

differentiated approach is possible when measles is brought into groups of schoolchildren.

Thus, in the lower grades, where instances of bring in measles are most often limited to isolated cases of the disease under the effect of annual LMV revaccination of children 6-7 years of age, the preventive steps at the site of infection can be reduced to only prompt detection and isolation of measles cases from the group.

When a site of measles infection crops up in middle and higher school grades, it is desirable to expand the scope of measures, applying mainly measures aimed at raising the level of the actually immune stratum among the patient's contacts.

In summary, it should be concluded that, at the present stage, it is desirable to break regions down into rayons in accordance with the proposed criteria, in view of the substantial differences in measles morbidity indicators in different territories of the RF.

Territories with a morbidity rate of less than 10/100,000 population with stable high coverage of children up to 2 years old (at least 90 percent) with vaccinations, as well as with an insignificant number of individuals who are seronegative to the measles virus (no more than 7 percent) among children over 7 years old, should be classified as being in a good condition. For oblasts and rayons with higher morbidity rates, it is imperative to implement a set of additional measures aimed at raising the level of coverage with measles vaccination for children up to 2 years old, as well as increasing the stratum that is immune to measles in high risk groups and newly formed adolescent groups. Immediate epidemic-control measures when the first measles case appears at the infection site, as well as greater attention of physicians to early and differential diagnosis of measles, are important.

These steps, carried out within the framework of epidemiological surveillance of the infection, will stabilize measles morbidity rates in each territory of the RF and will bring us closer to solving the problem of eliminating measles from Russia.

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Optimum Conditions for Operation of Biosensor Using Urease and pH-Sensitive Field-Effect Transistors. Determination of Urine in Solution

947C0204A Kiev UKRAINSKIY BIOKhimICHESKIY ZHURNAL in Russian Vol.65 No. 1, Jan-Feb 94
(manuscript received 25 Jun 92) pp 110-113

[Article by O.A. Buryak, A.P. Soldatkin, I.F. Starodub, A.V. Yelskaya, A.A. Shulga, and V.I. Strikha, Institute of Molecular Biology and Genetics at Ukrainian Academy of Sciences, Kiev; UDC 577.15.086.543]

[Abstract] A biosensor with urease and two pH-sensitive field-effect transistor was tested for determination of urine in biological fluids such as blood, this technique being preferable to the more intricate and lengthy determination of ammonia on the basis of color reactions following hydrolysis of urine by urease. Inasmuch as the magnitude of such a biosensor response signal may depend on the ionic force and the buffer volume as well as on both temperature and pH of the tested solution, an experimental study was made for establishment of the optimum operating conditions. In the experiment were used grade B urease from soya beans (activity 12 units/mg), bovine serum albumin (BSA: bis-trimethylsilyl acetamide), glutaric aldehyde, ethylene diamine tetraacetate (EDTA), and other either chemically or extra pure reagents. The biosensor was built with LOCOS n-channel field-effect transistors. Its matrix, consisting of urease and BSA in a 1:1 ratio dissolved in a 20 mM pH 4 KHPO₄-NaOH buffer to a final mixture concentration of 100 mg/ml, was immobilized in an albumin layer by glutaric aldehyde and then an about 0.1 µl large droplet was deposited on the pH-sensitive surface of one transistor. An equally large control droplet of only BSA solution in the same buffer fluid was deposited on the pH-sensitive surface of the second transistor. After these membranes had been deposited, both transistors were stored in a 5 mM pH 4KHPO₄-NaOH buffer containing 1 mM or was then EDTA. The entire device was then immersed vapor of glutaric aldehyde for a 30-40 min duration, whereupon both membranes were dried in air. Prior to measurements, the biosensor was soaked for 30-60 min in the same buffer

fluid. Measurements were made at room temperature, in a glass beaker of 3 ml capacity with continuous stirring. The activity of immobilized urease was monitored by the phenol-hypochloride method. Measurement of the biosensor response signal revealed a dependence of its magnitude on the buffer concentration, its magnitude decreasing fast to less than 10 % as the buffer concentration was increased from 1 mM to 10 mM and then slower as the buffer concentration was further increased to 20 mM. Considering the presence of substantial amounts of NaCl in the blood, a separate experiment was performed concerning its effect on the biosensor response. Adding salt up to a 200 mM concentration decreased the response signal down to approximately half its magnitude in the absence of salt and increasing the salt concentration further up to 500 mM did not decrease the signal any further. Maximum signal and maximum rate of signal buildup were recorded in pH 7.0-7.5 solutions, this being also the range of pH variation in blood. A temperature rise from 15°C to 30°C did not change the magnitude of the biosensor response signal, even though it was found to change appreciably the activity of immobilized urease. The results of this study indicate that a biosensor with urease and pH-sensitive field-effect transistors is suitable for urine determination in blood. Figures 2; references 15.

Toward a Biophysical Interpretation of the Mechanism of Erythrocyte Diapedesis in Q Fever

947C0210 Kazan KAZANSKIY MEDITSINSKIY ZHURNAL in Russian Vol.74 No.5, Sep-Oct 93
pp 370-371

[Article by R. Ya. Gilmutdinov, R. I. Sitdikov, Kazan; UDC 616.928.8-02:616.155.3-008.11]

[Abstract] Q fever is a serious infectious disease in the rickettsial group. It affects people and animals. There are strong inflammatory reactions in the affected organs with an increase in organ permeability. There is a significant electric charge on the most prevalent blood components, and this changes in the presence of infectious diseases. This factor may be involved in diapedesis, especially in the case of Q fever. The connection between the electrophoretic mobility of erythrocytes and diapedesis in the development of Q fever was studied. Microscopic studies revealed the first indication of insignificant diapedesis in guinea pigs on the fifth day after the introduction of the antigen in individual guinea pigs in the mesenteric and hepatic lymph nodes, in some sections of the spleen, and reticular zones of the adrenal glands. By the tenth day some hemorrhaging appeared and macrophages were present on the fifteenth day. The macrophages contained remnants of the breakdown of erythrocytes. Sources of hemorrhage were in the perifollicular zone of the lymph nodes. In days 30-120 hemorrhaging extended to regions far beyond the site of antigen introduction. Figures 3.

MEDICINE AND PUBLIC HEALTH

Problems and Perspectives in Soil Management in Chernozem Zone of Russia

947C0218A Moscow DOSTIZHENIYA NAUKI I TEKHNIKI APK in Russian No. 4, 1993 pp 9-11

[Article by M.M. Lomakin, doctor of agricultural sciences]

[Abstract] The extensive loss of arable lands to water erosion in the chernozem zone of Russia now stands at 3 million hectares, out of a total of 11 million. Another 140,000 hectares have been determined to be currently at risk. In view of this situation, which seriously threatens the agricultural base of Russia, extensive studies had been undertaken to preclude progression of erosion. Based on the conditions applicable to different localities and predominant crops, amelioration includes judicious use of crop rotation schemes designed to provide strong root networks to keep the soil in place. In addition, plowing techniques have been modified to diminish soil damage and compaction, no-tilling farming has been implemented in some regions, and biological measures are widely employed to bring the earthworm density to 30 to 35 worms per square meter. Other efforts include the planting of stands of trees at strategic sites in a further attempt to control spring runoffs. The hope is that these measures, in conjunction with diminished use of pesticides and better utilization of fertilizers, will preserve the chernozem zone as a leading factor in Russian agriculture. Tables 4.

Soil Fertility in Ural Region

947C0218B Moscow DOSTIZHENIYA NAUKI I TEKHNIKI APK in Russian No. 4, 1993 pp 11-13

[Article by V.S. Kucherov, S.B. Kenenbayev and S.G. Chekalin, cand. agricult. sci., Kazakh Scientific Research Institute of Agriculture imeni V.R. Vilyams; Ural State Agricultural Experimental Station]

[Abstract] In the last two to three decades arable lands in the Ural region lost 20-25% of their humus, a loss approaching 30% in some areas. Studies on various schemes of soil improvement have shown that best results in raising the humus content are obtained with use of appropriate mineral fertilizers and sideration. The preliminary results have shown that such measures can be a significant factor in raising the fertility of some 300,000 hectares in the Ural region. Consequently, the potential is there for markedly improving the yields of winter rye, winter wheat and spring wheat in the Ural region. Tables 1.

Novel Approaches to Erosion Control in Southeastern Central Russian Plateau

947C0218C Moscow DOSTIZHENIYA NAUKI I TEKHNIKI APK in Russian No. 4, 1993 pp 13-15

[Article by I.G. Zykov, doctor agricult. sci., S.P. Pomeshchikov, cand. agricult. sci., All-Russian Scientific Research Institute of Land and Forest Reclamation]

[Abstract] Technical details are presented on the construction of draining networks for the control of erosion in the Southeastern Central Russian Plateau. Studies on the specific erosion characteristics involving six rivers (Tishanka, Kurtlak, Krepkaya, Kumylga, Sukhodol, Tsaritsa) and their flow patterns led to identification of optimum design strategies in for each case. The plans also involve construction of holding ponds to dampen the force of water, lessen soil damage and divert a portion to tree stands planted for additional control of soil erosion. Figures 4.

Interview With the Chief of the Department of Aviation and Space Medicine, Academy of Cosmonautics

Moscow KRASNAYA ZVEZDA in Russian 15 Feb 94 p 2

[Interview with Vasiliy Semenovich Novikov, Chief of Department of Aviation and Space Medicine, Academy of Cosmonautics, by KRASNAYA ZVEZDA correspondent Colonel Valeriy Streltsov: "Space Department's Earth Orbits"; italic as published in source text]

[Text] *The Military Medical Academy is undoubtedly a foremost of military medical science and practice and a most important teaching and methodological center. The enormous amount of experience accrued within its walls works not only for Russia's Armed Forces but is also being used by Russian health care and physicians in other countries. But there are subdepartments in the academy itself that while not having a great history, nevertheless largely dictate its current prestige. Among them is the department of aviation and space medicine, which was born out of the demands of the space era.*

Unfortunately, its work was surrounded in a shroud of secrecy, and few knew of the existence of such a department. Today KRASNAYA ZVEZDA is filling in this gap. Valeriy Streltsov, chief of the department, corresponding member of the Academy of Cosmonautics, doctor of medical sciences, professor, and colonel of the medical service, responds to the questions of Colonel Valeriy Streltsov, our regular correspondent in the Leningrad Military District.

[Streltsov] Vasiliy Semenovich, your department is young. Doesn't that mean that its founders—your predecessors—began development of the problems of aviation and space medicine "from scratch," as they say?

[Novikov] In fact, the date of the department's "birth"—the end of the fifties—was the time of the beginning of

man's breakthrough into space. But it is young, and with rare exception, my colleagues have crossed the 40-year age mark.

But of course they did not begin "from scratch." The direct base of our department was the department of military labor physiology, which at the end of the fifties was directed by Mikhail Pavlovich Brestkin, USSR State Prize laureate, professor, and major-general of the medical service. Several studies of importance for aerospace medicine were conducted within that department's framework. And before that, Academician Leon Abgarovich Orbeli, the world-renowned physiologist, worked on the development of these problems.

Nevertheless, without in any way diminishing the services of these eminent scientists, it must be said that there was no purposive training of specialists in aviation and space medicine within our academy's walls. And this is not surprising, for indeed the need for such specialists arose in the space era.

[Streltsov] And is the research you conducted being used somewhat more widely in medical practice in general? Or are the studies the property of only those who serve in aviation and work in space?

[Novikov] Primarily, of course, we work in space and aviation. More than a thousand physicians and dozens of specialists directing medical personnel have been trained for us, and hundreds of officer-physicians have received postgraduate advanced training here. The department's scientists have been involved in the development of many urgent problems of space medicine, for example, the mechanisms of boosting the resistance of pilots' and cosmonauts' bodies to flight factors. The studies are conducted both under experimental conditions and under natural conditions with the participation of all of the academy's specialists and colleagues from the Cosmonaut Training Center imeni Yuri Gagarin.

I would call hypobaric hypoxia, a new way of keeping pilots and cosmonauts healthy during flight and after flight, our little baby. Hypobaric hypoxia is also used in treating many diseases, such as asthma, diseases of the lungs and endocrine organs, diseases of the cardiovascular and immune systems, diseases of the blood, and the initial stages of sugar diabetes. They all react to hypoxia to one degree or another and succumb to it.

How is the treatment performed? The patient is placed in a pressure chamber with a reduced oxygen content. As a result, the body "triggers" mechanisms directed toward increasing consumption of oxygen from the environment and supplying it to the tissues more efficiently. This is done to optimize the subjective state, normalize the functions of the autonomic nervous system, increase the number of erythrocytes, activate the immune system, and increase the body's overall resistance. Thanks to hypobaric hypoxia, it has been possible to help relieve hundreds of patients of ailments in our department alone.

[Streltsov] Do Russia's space physicians, and the scientists of your department in particular, have any points of contact with your foreign colleagues?

[Novikov] We contact our Western colleagues regarding many questions, including questions in the field of aviation and space medicine. The Americans are interested in our program for training specialists. And we have found kernels of efficiency in their training systems.

Representatives of NASA and the U.S. Health Service have visited our department. Moreover, they have become very interested in hypobaric hypoxia. It turns out that the method has no analogues in foreign practice. We in turn were curious about NASA's work on the problems of man's long-term stay in weightlessness even though we have been doing our own work.

[Streltsov] Increasingly newer prospects regarding assimilation of space have recently been unfolding. What is being undertaken so that the new reinforcement of aviation and space physicians meet the ever-growing demands for specialists of their profile?

[Novikov] The guarantee that we do not lag behind along the way is our close interaction with the Cosmonaut Training Center, Aviation and Space Medicine Institute, Biomedical Research Center, and other solid scientific institutions. And the academy is closely tied to military practice as well. I will remind you that in addition to everything else, the department is involved in the post-graduate training of specialists.

It should also be noted that our graduates do not just acquire fundamental knowledge about aviation and space medicine in general but rather receive both theoretical and practical training that makes them capable of independently evaluating the mechanism of the changes occurring in the human body and using modern methods of maintaining and restoring the fitness for duty of pilots, cosmonauts, and people in general. And what is more, while still within the academy's walls, students receive solid skills for managing the activity of the medical service of a unit or subdepartment during peacetime and wartime. Moreover, this program is new and has existed for only the past 2 years. But the response from the troops has been most reassuring.

Similar Susceptibility of Neurotoxic Esterases of Chicken and Rat Brains to O-Alkyl-O-Alkylchloroformiminophenylphosphonates
947C0192A Moscow DOKLADY AKADEMII NAUK
in Russian Vol. 332 No. 5, Oct 93 pp (manuscript
received 11 Jun 93) pp 650-653

[Article by G.F. Makhayeva, I.V. Filonenko, V.V. Malygin and I.V. Martynov, corresp. member, Russ. Acad. Sci., Institute of Physiologically Active Substances, Russian Academy of Sciences, Chernogolovka, Moscow Oblast; UDC 547.26.118.577.152.311: 541.697+519.327.5]

[Abstract] Determinations were made of the I_{50} values of a series of O-alkyl-O-alkylchloroformiminophenylphosphonates for neurotoxic esterases (NE) isolated from the (P₂ + P₃) membrane fractions of chicken and rat brains. The high correlation coefficients ($r^2 = 0.951$, $n = 18$) demonstrated essentially identical sensitivity of the two NE species to the organophosphorus compounds (OC) and, thus, identical active sites on the enzymes. Accordingly, rat brain NE is also suitable used for screening OCs for delayed neurotoxic sequelae, in addition to conventional tests relying on chicken brain NE. Furthermore, these observations also demonstrate that mechanisms other than the nature of NE are responsible for the diminished susceptibility of rats to OCs vis-a-vis the chicken. Figures 3; tables 1; references 15: 2 Russian, 13 Western.

Correlation Between Anti-HIV Activity and Configuration of Polyhydroxy Piperidines

947C0191A Moscow DOKLADY AKADEMII NAUK
in Russian Vol. 332 No. 5, Oct 93 pp (manuscript
received 02 Jul 93) pp 603-605

[Article by Ye.A. Smolenskiy, G.V. Grishin, G.M. Makeyev and N.S. Zefirov, academician, Institute of Organic Chemistry imeni N.D. Zelinskiy, Russian Academy of Sciences, Moscow; UDC 541.697]

[Abstract] An analysis was performed on the absolute relationships between anti-HIV activity and spatial characteristics of 45 polyhydroxy congeners of piperidine and pyrrolidine [Fleet, G., et al., FEBS Lett., 237(1/2):128-132, 1988], using additive (5 parameters) and non-additive (2 parameters) approaches. Determination of correlation coefficients narrowed the compounds to 17 in which activity was clearly dependent on chirality and spatial orientation of substituent groups on 3(5) and 4 positions of the piperidine ring, and on the nature of the N-exocyclic substituent. In the non-additive mode reliance on 2 descriptors (cis-3,5-hydroxyl group; N-alkyl group) yielded a coefficient of 0.8699, which rose to 0.98860 when a compound containing α -methoxycarbonylpentyl radical was excluded. In the final analysis, the non-additive model yielded higher correlation coefficients than the additive model with 3 fewer descriptors. Tables 5; references 6: 2 Russian, 4 Western.

Ecological Problems of the Urals

947C0215A Yekaterinburg DEFEKTOSKOPIYA
in Russian No. 7, 1993 /manuscript submitted
24 Mar 93/ pp 38-46

[Article by V. N. Chukanov, P. V. Volobuyev, V. A. Poddubnyy, A. V. Trapeznikov, Institute of Industrial Ecology, Urals Division, Russian Academy of Sciences, Yekaterinburg; UDC 581.5]

[Abstract] The Ural Economic Region is on the watershed of the river systems of the Mid-Russian Plain and

Western Siberia, which drain the region. The biosystems in that region are not very resistant to anthropogenic effects because of the small amount of precipitation, the erosion-susceptible relief, the continental climate, the relatively poor flora and fauna, the nature of the soil cover, and, in the near Transurals, the absence of large rivers. Unfortunately, the concentration of industry in the Urals is 2-3 times greater than the average for the rest of the country. For various reasons, 80 percent of the materials extracted for the metallurgical industry end up in the tailings. Some 2,000 sq. km of land is tainted or is under such tailings. Atmospheric pollution in the Urals is the worst in the country. The forests are being cut too quickly, with no more than 20 years of reserves left in any given forest area. Uranium processing and nuclear explosions have left their mark on the region in terms of radiation contamination. Specialists from the Science and Engineering Center for Environmental Safety and the Institute of Industrial Ecology of the Urals Division of the Russian Academy of Sciences have developed a program for analyzing the region and the health of the populace with an eye to developing measures that will ultimately restore normal living conditions for the urban population and restore and protect health.

Migration and Biological Action of Radionuclides in Forest Biogeocenoses in the Chernobyl Nuclear Power Plant Area

947C0215B Yekaterinburg DEFEKTOSKOPIYA
in Russian No. 7, 1993 /manuscript submitted
17 Jan 92/ pp 47-53

[Article by I. V. Molchanova, Ye. N. Karavayeva, P. I. Yushkov, V. N. Pozolotina, N. V. Kulikov, Institute of Plant and Animal Ecology, Ural Division, Russian Academy of Sciences; UDC 581.5]

[Abstract] Soil and grass samples taken in long-term radioecology and radiobiology studies of forests within a 30-km radius of the Chernobyl Nuclear Power Plant indicate that the gamma background in the treetops of the pine-birch forest stands 1.5 km to the west of the plant ranged from 20 mR/hr to 40 mR/hr in 1987, but dropped to 3-19 mR/hr in 1988. Soil-surface beta levels for the same area reached 150,000 particles/cm²/min in 1987. A second stand 6 km southeast of the plant showed gamma levels of about 3 mR/hr, with beta levels at 40,000 particles/cm²/min, and a third stand—18 km to the south of Chernobyl—gave readings of no more than 0.6 mR/hr and 6,000 particles/cm²/min. Birch and dandelion seeds were collected in 1987 and 1988, as were plantain seeds in 1989. Seed mass increased among the birch and plantain seeds, which were gathered in areas of relatively higher levels of contamination. Irradiation challenge and temperature variation while seeds were sprouting identified a latent variability. In general, ¹³⁷Cs levels were found to be greater than ¹³⁴Cs levels, which in turn were greater than ⁹⁰Sr levels. Plants and soils from watershed areas and from river valleys in which the

soil was turf-covered showed the highest levels of contamination. Figures 5, references 12: 11 Russian, 1 Western.

Effect of Ecology on Migration of Thorium Isotopes in Soil- Plant System

947C0215C Yekaterinburg DEFEKTOSKOPIYA in Russian No. 7, 1993 [manuscript submitted 21 Jul 92] pp 54-61

[Article by I. I. Shuktomova, N. A. Titayeva, I. G. Kochan, Institute of Biology, Komi Science Center, Urals Division, Russian Academy of Sciences; UDC 546.841.631.438:581.5(470.1)]

[Abstract] Studies of the state and behavior of ^{232}Th , ^{230}Th , ^{228}Th , and ^{227}Th in the soil cover of areas in which the soil-forming rock and soil have high natural levels of thorium indicated that the ^{228}Th daughter radionuclide is the more accessible of the two genetically related isotopes. The observable ratios for $^{228}\text{Th}/^{232}\text{Th}$ were found to be 29.8 for bushy plants and 18.9 for grassy plants. Those ratios for $^{227}\text{Th}/^{230}\text{Th}$ were 3.1 and 12.4, respectively. Such ratios indicate that some portion of the ^{228}Th and ^{227}Th in the bushes was formed right in the plants from ^{228}Ra and ^{227}Ac entering through the roots. The ratios for $^{230}\text{Th}/^{232}\text{Th}$ were 18.2 for bushes and 1.62 for grasses, indicating better uptake by the plants of the uranium-series isotope than of the thorium series parent. References 3 (Russian).

Echinococcal Strains in Yakutia

947C0195A Moscow VETERINARIYA in Russian No. 9, Sep 93 pp 36-39

[Article by S.I. Isakov, M.G. Safronov and R.N. Ivanova, Yakut Scientific Research Institute of Agriculture; UDC 619:616.995.1]

[Abstract] An epizootic study was undertaken on echinococcosis in the Republic of Sakha (Yakutia) in order to identify primary human risk factors. Clinical and laboratory examination of thousands of domestic and wild animals (dogs, reindeer, moose, wolves, horses, pigs, cattle, etc.) led to the identification of 3 echinococcal biotypes. These differ in host preference and pathologic manifestations and fall into the following major categories: moose type (wolf-moose-wolf cycle), reindeer type (polar wolf-northern reindeer-polar wolf), and bovine type (cattle-dog-cattle). In general, hunting and feral dogs were felt to be the primary source of human infestation.

Rapid Method for Elimination of Cs-137 from Venison

947C0191B Moscow DOKLADY AKADEMII NAUK in Russian Vol. 332 No. 5, Oct 93 pp (manuscript received 01 Jun 93) pp 644-645

[Article by A.I. Ilyenko and T.P. Krapivko, Institute of Evolutionary Morphology and Ecology of Animals imeni A.N. Severtsova, Russian Academy of Sciences, Moscow]

[Abstract] Trials on boar (*Sus scrofa*) and moose (*Alces alces*) venison contaminated with Cs-137 showed that gamma irradiation (Co-60 source) of the samples before wash-out with a salt-acetic acid solution (30g/L NaCl, 70% CH₃COOH (10 mL/L of tapwater)) facilitated elimination of Cs-137. For example, 0.5-1.0 kGy (9.85 Gy/min) gamma irradiation of the frozen boar samples, thawing, sectioning of the sample into 25-29 g pieces, and washing with changes of the solution every 1 or 3 h reduced the Cs-137 counts from 6.73×10^8 to 0.26×10^8 Ci/kg after 3 h. The reduction in moose samples was from 4.42×10^8 to 0.52×10^8 Ci/kg. In both cases Cs-137 was reduced to below the maximum permissible threshold and was significantly greater than in gamma unirradiated samples. The efficacy of gamma irradiation was attributed to tissue breakdown and increased membrane permeability, factors which favor release of Cs-137 from the intracellular compartment. Figures 1; tables 2; references 11: 3 Russian, 7 Western.

Psychoneurological Status of Persons Living in an Area of Radioactive Contamination

947C0167A Minsk ZDRAVOOKHRANENIYE BELARUSI in Russian No. 6, Jun 93 (manuscript received 16 Jan 93, graph not available for reproduction) pp 5-9

[Article by V.V. Filipenko, Gomel Oblast Psychiatric Hospital No. 1; first paragraph is ZDRAVOOKHRANENIYE BELARUSI abstract; UDC 616.85-07:616.891]

[Text] The internal disease picture of 102 neurosis patients living in an area of radioactive contamination was studied. The relationship between estimation of the risk of the consequences of the accident at the Chernobyl Nuclear Power Plant, behavioral reactions, and clinical picture of the disease was clarified. It was established that fear of waiting for the consequences of irradiation is accompanied by catastrophe-associated behavioral reactions of stimulus avoidance and is expressed clinically in asthenic and stomatovaginal disturbances.

After the accident at the Chernobyl Nuclear Power Plant, an increase in neurotic and psychosomatic diseases was observed in the affected regions of Belarus.^{2,3} After the accident at the nuclear power plant at Three-Mile Island in 1979, American psychiatrists also noted an increase in the number of affected persons with generalized anxieties and posttraumatic stress disorders, as well as marked depression.^{7,8}

To date, the specifics of post-Chernobyl stress and the dynamics of psychiatric dysadaptation have been reflected in the literature, and the structure of psychopathological disorders in those who cleared the accident has been revealed.^{1,5} The problems of the interaction of chronic stress and the individual have yet to be studied sufficiently, however, and the contentual side of mental experiences have yet to be analyzed sufficiently on a psychotherapy plane.⁴

The purpose of this work was to study the internal disease picture in neurosis patients living in the Gomel Oblast in an area of radioactive contamination with a density of cesium 137 of 1-5 Ci/km². The subjects were selected so as to minimize the effect of radioactive irradiation on the clinical picture of their disease, thereby concentrating attention on the psychologically traumatic aspects of the accident.

Materials and Methods

The patients were subjected to a comprehensive clinical-psychological examination at Gomel Psychiatric Hospital No. 1 in 1992. A total of 102 neurosis patients (69 women and 33 men aged 18 to 44 years) were studied. Thirty of them were diagnosed with neurasthenia, 21 with hysterical neurosis, 19 with depressive neurosis, 18 with neurotic phobias, 8 with hypochondriacal neurosis, and 6 with compulsion neurosis. The examination group did not include any persons involved in clearing the consequences of the accident or migrants. The control group consisted of 31 mentally healthy individuals living under the very same ecological conditions as the patients.

The cognitive level of the internal disease picture associated with each patient's idea of his disease was studied by the "subjective ranking" method. The test subjects were ranked in order of preference of six sources of stress with respect to their effect on the occurrence of disease. Three

of the statements dealt with the consequences of the accident, and three included problems of everyday life. The sensory-emotional level dictated by pathological perceptions was analyzed by using a checklist of symptoms including seven syndromologic subscales and Spielberger's Anxiety Scale [STAT]. The distinctive features of the motivational-behavioral reactions accompanying a change in lifestyle under conditions of distress were estimated by using the Influence of Event Scale [IES]. This scale is used in diagnosing posttraumatic stress disorder according to the description in the DSM-III-R and makes it possible to identify two types of reactions to mental trauma: "immersion" and "avoidance."¹⁹ The data were processed by analysis-of-variance methods using Spearman's rank correlation coefficient on an IBM PC/AT.

Results and Discussion

Of the entire examination group, 25 patients linked the occurrence of their disease to the consequences of the accident, and 77 patients named everyday life events as the leading psychologically traumatic factors.

An analysis of the mean group ranks with respect to each of the six sources of stress revealed that social-environmental (work, family, and everyday life) psychogenesis (Table 1) ranked first among the reasons for disease. Their leading posttraumatic role in the etiology of neuroses is obvious.

Table 1. Indicators of the Internal Disease Picture in Neurosis Patients (X +/- m)

Indicator	Patients (n = 102)	Controls (n = 31)	P
Anxiety, STAT			
situational	55.14 +/- 1.04	45.81 +/- 1.54	< 0.001
personality-related	56.08 +/- 1.06	43.35 +/- 1.64	< 0.001
Everyday sources of stress			
biological	3.55 +/- 0.15	4.34 +/- 0.23	< 0.01
social	2.15 +/- 0.15	2.45 +/- 0.30	> 0.05
psychological	3.46 +/- 0.15	3.77 +/- 0.32	> 0.05
Post-Chernobyl sources of stress			
biological	4.51 +/- 0.14	3.71 +/- 0.30	< 0.02
social	4.59 +/- 0.15	4.00 +/- 0.29	> 0.05
psychological	2.74 +/- 0.13	2.68 +/- 0.23	> 0.05
Influence of Event scale, IES			
Immersion	6.04 +/- 0.56	1.84 +/- 0.39	< 0.001
Avoidance	11.63 +/- 0.83	8.39 +/- 0.83	< 0.01
Clinical picture, SCL			
Anxiety	8.61 +/- 0.35	2.48 +/- 0.32	< 0.001
Sleep disorder	7.55 +/- 0.31	2.68 +/- 0.43	< 0.001
Autonomic disorders	24.01 +/- 0.91	3.74 +/- 0.70	< 0.001
Asthenia	8.62 +/- 0.33	2.90 +/- 0.44	< 0.001
Depression	8.47 +/- 0.36	2.03 +/- 0.42	< 0.001
Obsessions and phobias	5.16 +/- 0.35	0.55 +/- 0.18	< 0.001
Hysterical disorders	7.33 +/- 0.35	0.81 +/- 0.23	< 0.001

Under the conditions of post-Chernobyl stress, however, the psychological aspect of the accident's consequences ranks second in the structure of patient experiences. Worry about one's health and the fate of one's friends and relatives, especially one's children, and a feeling of uncertainty and fear of the long-range effects of irradiation constitute its conceptual content. Patients selecting this factor as the leading cause of their neurosis were more likely to be awaiting the health consequences of radiation than to be certain of certain symptoms with irradiation.

This complex of ideas was accompanied by motivational-behavioral "avoidance" reactions ($r = 0.25, p < 0.05$). They include persistent and stubborn ignoring of thoughts, feelings, stimuli, and activity associated with the accident. A lack of desire to take particular precautionary measures because that would inevitably lead to a revival of experiences associated with the event was characteristic for many patients. Possibly this is an explanation of the previously observed failure of victims to fully adhere to safety measures.¹ Sometimes patients could not recall the exact date of the accident or the level of radioactive background in the places where they live, which is similar to the phenomenon of psychogenic amnesia. The patients experienced a feeling of dismissal of or estrangement were projected into the future and were accompanied by a decrease in interest in meaningful activity: "What awaits us? Nothing good."

"Avoidance" reactions have a definite similarity with such psychological defense mechanisms as "denial" and "displacement." In psychodynamic theory they are viewed as leading to the progression of affect from the mental to the somatic sphere, which was confirmed in the correlation between "avoidance" reactions and disorders of the asthenic ($r = 0.25, p < 0.05$) and somatovegetative ($r = 0.3, p < 0.05$) spheres. Patients with asthenic disorders complained of irritability (35 percent), rapid physical fatigability (32.5 percent), inability to tolerate loud noises or bright lights (22.5 percent), and a deterioration of attention and memory (12.5 percent). Their background mood was reduced to the level of subdepression. Their somatovegetative complaints included decreased appetite (32.5 percent), feeling hot or chilled (20 percent), dizziness (20 percent), dryness or a metallic taste in the mouth (20 percent), heart palpitation (17.5 percent), headache (15 percent), and feeling worse when the weather changes (15 percent).

A decrease in psychoemotional stress mediated by the consequences of the accident was thus obtained by patients in this group because of their evasion of potentially alarming information. This led to the development of asthenia and/or was accompanied by somatization of affect with a shift in emphasis from the external threat to processes occurring in their own body. Overall, this type of attitude toward disease may be termed one of "uneasy anticipation."

Psychological and biological problems of everyday life ranked third and fourth. They include negative self-estimate and consequences of illnesses suffered previously.

The biological component of the accident ranked fifth among the stresses. Patients who considered this fact decisive in the development of their neurosis denied the psychogenic nature of their illness and were certain that their feeling bad was linked to irradiation. This certainty was correlated with behavioral reactions of "immersion" ($r = 0.3, p < 0.05$), including fixation on traumatic experiences. The patients experienced intensive psychological dejection in events symbolizing or reminiscent of trauma (television marathons and newspaper publications). These experiences were manifested clinically in anxiety ($r = 0.24, p < 0.05$), obsessive-phobic ($r = 0.25, p < 0.05$), and hysterical ($r = 0.29, p < 0.05$) symptom complexes, and they were interlinked to personality-related anxiety ($r = 0.23, p < 0.05$).

The patients stated that during the half-year before they came to the hospital they constantly experienced a feeling of internal stress (32.5 percent), floods of alarming thoughts related to health problems (27.5 percent), restlessness (20 percent), and fear of possible unpleasant experiences (15 percent). Depending on the reviewer group's information or opinion regarding the consequences of irradiation, alarm could be replaced by fear and a feeling of not some nonspecific but rather some concrete threat (cancer of the thyroid gland and blood diseases).

Obsessive-phobic syndrome was characterized by sudden recollections of life before the accident more so than of the accident itself (17.5 percent). They were accompanied by a distressing feeling of powerlessness, the impossibility of changing anything, and the experience of one's own powerlessness at that moment when these thoughts took over. It was often possible to hear that the gardens used to flower better before and the harvests used to be bigger. Not infrequently, patients complained of compulsion phenomena of the "intellectual ruminations" type and of the problem of "to leave or not." This compelled them to weigh the benefits of one decision or another an infinite number of times and led to exhaustion. The impossibility of completely controlling the level of irradiation led to the manifestation of neophobias with restrictive behavior (15 percent). The patients experienced fear when outside the places where they had always lived: "I do not know the background here. That is why I am afraid." These symptoms must not be completely classified as phobias, however, because often they were well founded.

Compulsive thoughts reaching the vividness of illusions or metamorphosias were characteristic for the hysteria patients. They appeared in the form of "visualization" of the radiation: "The scum from the potatoes grew larger, the earth yellowed before our eyes" (10 percent). Patients complained of feeling lumps in their throats (13 percent) and a feeling of numbness in their hands and

feet (15.5 percent). The interpretation of these symptoms, which are pathognomonic for hysteria, is interesting. In the first case, patients considered them a consequence of iodine load, i.e., "the thyroid gland feels heavy," whereas in the second case, the symptoms developed in accordance with a conversion mechanism, i.e., "the irradiation even acted in the earth." This type of patient may be characterized as "fatalistic."

The social aspect of the accident, specifically, certainty that there was an inadequate amount of social and medical assistance to victims, ranked last among the stress factors. A number of patients overvalued the social benefits provided and developed a victim's psychology. This led to a unique externalization of personality with an emphasis on an external "fulcrum." In this case, living in contaminated territories may be a socially acceptable factor explaining the surrounding "rush to disease" among this group of persons examined. In view of the small size of this group, no correlations between social estimate of the accident's consequences, behavioral reactions, and clinical picture of neurosis were obtained.

Overall, anxiety, asthenic, and depressive disorders and "avoidance" behavioral reactions predominated in the patient group's clinical picture. When compared with the control group, they had statistically significantly higher values for all of the indicators studied except estimate of stress sources (see Table 1). The significance of the accident's biological aspect as a psychologically traumatic factor was higher in the healthy group; however, the traumatic significance of the social and psychological aspects did not differ significantly from that in the patient group. Thus, 6 years after the accident, post-Chernobyl stress has a mediated rather than reactive role in the development of neurotic disorders.

To develop a psychotherapeutic strategy under conditions of ecological stress, we performed a correlation analysis for each rank pair of stress sources.⁶ In Figure 1 they are arranged in the space of two main axes in accordance with their rated relationship. As is evident, patients who consider the accident at the Chernobyl Nuclear Power Plant the leading psychogenic factor rejected the idea that the problems of everyday life are psychologically traumatic and were extremely concerned about their own health (hypochondriacal).

Conducting psychotherapy with this group required establishing statistically significant interconnections even in the initial stage of identifying their concept of their disease. Next, we tried to delicately expand their range of experiences with emphasis on timely albeit sometimes unconscious inter- and intrapsychic conflicts. The conduct of group psychotherapy, which enables patients to correlate their experiences with the problems and values of people around them and thereby reduce their hypochondriacal fixation, was suited to these purposes. The predominant neurosis among the neurosis patients was a nonconstructive form of reaction directed against the stressor "avoidance." We tried to transform

it into a reaction directed toward the stressor "approximation" by emphasizing measures to protect against radiation. When conducting explanatory psychotherapy, we convinced patients that the circumstances that had developed could be controlled, thereby enabling them to assume responsibility for their own fate and for the future of those close to them.

Conclusions

1. Fear of waiting for the consequences of irradiation is the leading psychologically traumatizing factor in post-Chernobyl stress.
2. The prevailing forms of psychological defense in the patients studied are "displacement" and "denial" of thoughts, feelings, and stimuli mediated by the accident, which leads to asthenization and/or somatization of affect.
3. Neurosis patients living in radionuclide-contaminated territories need explanatory psychotherapy with emphasis on measures to protect against radioactive irradiation.

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Sociological and Medical Aspects of Chernobyl Accident

947C0167B Minsk ZDRAVOOKHRANENIYE BELARUSI in Russian No. 6, Jun 93 (manuscript received 22 Jan 93) pp 10-13

[Article by I.V. Kotlyarov, doctor of sociological sciences, and A.S. Terebov, candidate of philosophical sciences; first paragraph is ZDRAVOOKHRANENIYE BELARUSI abstract; UDC 614.73:616-053.2]-0.82(476.2)(476.4)]

[Text] Data from a sociological study of the state of medical service provided to children among the populations of individual rayons of the Gomel and Mogilev oblasts are presented along with information regarding the completeness of the implementation of government decrees regarding clearing the consequences of the accident at the Chernobyl Nuclear Power Plant.

One of the most important problems that life has put before people who have found themselves living in an area of radioactive contamination is that of maintaining their health. It is precisely for this reason that the Sociology Institute of the Byelorussian Academy of Sciences and MP [not further identified] Paradigma conducted a sociological study of the problems of children and teenagers in rayons contaminated with radionuclides. The main task of the study was to analyze the implementation of the corresponding laws, normative documents, and above all the Byelorussian Republic's special integrated program Protecting Motherhood and Childhood Under the Conditions of the Consequences of the Catastrophe at the Chernobyl Nuclear Power Plant in 1991-1995 in these areas. For this purpose, researchers studied documents of the authorities at various levels (above all, those of health care authorities) in Minsk and in the Gomel and Mogilev oblasts. Researchers surveyed 233 experts (specialists in the fields of radiation biology, medicine, and public education) and 566 respondents. They also conducted 20 standardized interviews with health care organizers.

The sociological study established that 27 percent of the respondents suffer from psychosomatic disorders and that this leads to acute impairments in personality and social adaptation and facilitates an increase in neurotic reactions. The objective and subjective stress-inducing factors cited are having a significant effect on the people's mental state and social activity, reducing their effectiveness at work, and sharply increasing their anxiety regarding their health status. During the survey period, 61.6 percent of the respondents experienced a feeling of anxiety, 74.4 percent were in a state of preoccupation, and 72.6 percent experienced great worry. But how could it be otherwise when only 8 percent of those surveyed in the Gomel Oblast and 11 percent of those

surveyed in the Mogilev Oblast rate their own health as normal whereas more than 40 percent rate it as unsatisfactory?

Why have things turned out this way? A whole series of factors are facilitating an increase in the efficiency of health care authorities' activities. But as studies have shown, they have not had time to fully take effect. Explanatory work related to popularizing scientific knowledge about the consequences of the effect of radioactive factors on man is, for example, of no small importance to protecting the public's health. As the residents of the contaminated rayons and specialists (80.2 percent) confirm, however, such work is barely being done. A content analysis of documents revealed that executive bodies are virtually ignoring it because they have neither the personnel nor the corresponding structures for it.

Under the conditions of an absence of full-fledged information about the actual threat in rayons with various degrees of radioactive contamination, serious discrepancies between objective indicators of radiation risk and perception of that risk in people's consciousness often arise. Several negative psychosocial phenomena are linked to this. One is that the state of today's anxiety regarding children's health and future had reduced the childbirth level. Only 4.3 percent of those women under the age of 40 who were surveyed expressed a readiness to increase their family in the near future. More than three-fourths of those surveyed (78.7 percent) took the opposite position. Of course, this is not just a reflection of the effect of Chernobyl-related stress but also of the sociopolitical crisis and the overall deterioration of the socioeconomic situation. It would be incorrect to underestimate the significance of postcatastrophe processes, however.

A second factor that has sharply worsened the psychosocial background in rayons with radioactive contamination is that requests for medical service have increased sharply (after the catastrophe the number of visits to physicians increased by a factor of 2 to 6), and the quality of medical services has decreased significantly in connection with the ever-more-acute shortage of physicians, nurses, other personnel, and necessary medications and drugs. As a result, only 13.7 percent of respondents in the Gomel Oblast are satisfied with the work of the territorial polyclinics and with the conduct of preventive care examinations of children. In the Mogilev Oblast the number is even lower—only 3.9 percent. The problem is especially acute in the Chausskiy Rayon, where only 3.2 percent of those surveyed are satisfied with the polyclinics' work and where nearly 17 times that amount, i.e., 52.7 percent, are dissatisfied.

There are a great many complaints regarding the provision of necessary medications and vitamins to children and teenagers living in contaminated territories. There are clearly not enough of even the most necessary drugs, and this comes at a time when it is impossible to use the

"people's" pharmacy. Thus, 74.9 percent of the respondents and 52.8 percent of the experts-specialists stated that children and teenagers are not being provided with necessary medications and vitamins.

In the contaminated area, interviewers were constantly asked the question: "When, finally, will residents of contaminated oblasts be provided with the necessary drugs?" It turns out that even according to official data, the republic's medical institutions received only 47 percent of the medications needed and that internal production of drugs presently accounts for only 19 percent of the amount needed.

On the whole, the level of specialized medical care does not satisfy residents of contaminated territories. In the opinion of more than two-thirds (67.0 percent) of the respondents, children and teenagers are not being provided with the necessary types of such care, and this comes under conditions of an increase in diseases and social anxiety.

The best developed link in the network of proposed work to minimize the consequences of the Chernobyl accident is the system of round-the-clock improvement of sanitary conditions and rehabilitation of children and teenagers. Thus, 7.1 percent of the respondents noted that it is effective, 15.0 percent said that it was more effective than ineffective, 30.4 percent said that it was more ineffective than effective, and 36.0 percent said that it was ineffective. At the same time, as was noted by those residents of radionuclide-contaminated oblasts who were surveyed, there are also significant shortcomings in the improvement of the said system's activity. There are not enough spots in inpatient health improvement institutions, not enough financial resources, and not enough transport vehicles. And now they have even added boundaries between sovereign states. In the respondents' opinion, there are a great many irregularities in selecting groups of children sent abroad. It should be noted that comments were also made to the effect that money spent on health improvement should be directed toward construction of new settlements in clean areas.

People's health depends largely on the quality of the work performed by medical workers and other specialists working in radionuclide-contaminated territories. At the same time, the system to provide them with financial incentive needs improvement: 52.4 percent of the experts stated that it needs improvement, and 34.8 percent stated that it is more ineffective than effective.

On the subject of the physician salary provided in contaminated areas, it increased severalfold in certain cases, especially under the contract system. Today, however, a physician can calmly earn the same increased salary in a clean area if he wishes. Real financial stimuli for improving the work of specialists in contaminated areas are thus virtually nonexistent. In addition, 41.9 percent of medical workers in the Bykhovskiy, Slavgorodskiy, Chausskiy, Cherikovskiy, and Krasnopol'skiy rayons of the Mogilev Oblast and 40.1 percent of the

Yelskiy, Narovlyanskiy, and Lelchitskiy rayons and in the city of Mozyr in the Gomel Oblast are dissatisfied with their accommodations; 57.3 and 56.7 percent respectively are dissatisfied with community conditions; 80.5 and 82.0 percent respectively are dissatisfied with social-everyday life conditions (the service sector, consumer services, etc.); 90.2 and 83.3 percent respectively are dissatisfied with the food products with which they are provided; and 88.8 and 94.7 percent respectively are dissatisfied with the consumer goods with which they are supplied.

All of this was one of the reasons for the significant turnover of medical personnel. In the Mogilev Oblast alone, for example, about 35 pediatricians resign each year. The Supreme Soviet and republic government are deciding the matters of financial incentive, salary increases, and provision of accommodations extremely slowly, however.

A great many Chernobyl-related problems are outside the scope of the republic's scientific organizations and institutions, however. In the opinion of 54.9 percent of the experts, the level and direction of scientific research in the sphere of protecting the health of children and teenagers is completely unsuitable, and 29.6 percent considered it more unsuitable than suitable. The financial and diagnostic bases are completely unsatisfactory for the needs of the day, and scientific institutions specializing in solving Chernobyl-related problems only began being more or less financed just 1-2 years ago.

Various republic bodies are definitely working toward raising the qualifications of physicians, psychologists, and other specialists who deal with the problems of protecting the public's health. This category of workers is being trained systematically at institutes for advanced training of physicians and teachers, in short-term courses, etc. Nevertheless, 31.8 percent of the experts are dissatisfied and 33.9 percent are somewhat dissatisfied with the level of education, and 33.0 percent are dissatisfied and 33.5 percent are somewhat dissatisfied with retraining and advanced training for specialists in different areas.

At the same time, the residents of the rayons are dissatisfied with the level of qualifications of treating physicians, psychologists, and other specialists who examine children and teenagers: 61.0 percent of the respondents so stated. Cases of disregard, callousness, and indifference on the part of physicians are common not just in the rayon and local hospitals but also in the capital's institutions. The psychosocial background is so bad that it by no means facilitates the formation of a socially active personality. Fears for the health of the "children of Chernobyl" extrapolated into the future may, after 10-15 years, form a unique "net of outcasts" in the marriage sphere. Those who received significant doses of irradiation during their childhood and those who have lived in a contaminated territory for a long time will be included in it. The actual health hazard resulting from the fact that the risk of unfavorable mutations may increase after

the chronic action of ionizing radiations throughout a series of successive generations acquires, at least in the psychosocial perception of parents and their adult children, a totally real embodiment. Only 12.8 percent of respondents in the Gomel Oblast and 16.4 percent of those in the Mogilev Oblast stated that their children undergo regular medical checkups, and 24.7 and 10.7 percent respectively stated that they do not undergo such examinations at all.

One of the reasons for the situation that has been created is the fact that the decrees and various normative documents of the Supreme Soviet and government of the Republic of Byelarus and local authorities regarding solving Chernobyl-related problems have not "worked" to the extent necessary. The results of sociological studies confirm this conclusion. Only 16.8 percent of the experts and 9.7 percent of the respondents believe that the measures stipulated by different laws and normative documents intended to protect the health of children and teenagers in the Chernobyl area are effective; 81.1 percent of the experts and 83 percent of the respondents disagreed with this viewpoint. The others had difficulty answering.

The republic's normative documents related to solving the problems of improving children's health are not very effective according to 73 percent of the respondents, those related to organizing special regimens of study and rest for children are not very effective according to 87 percent, those related to medical services at educational institutions are not very effective according to 94 percent, and those related to organizing labor, rest, and medical services are not very effective according to 94 percent. A similar opinion (with only small 2 to 5 percent deviations) was expressed regarding the decrees of the local councils of people's deputies. The experts placed special emphasis on the fact that many of the laws, decisions, and normative documents are incomplete, not of sufficiently high quality, often abstract, and not economically fortified. They fail to give consideration to many desires and proposals that have come from the population of the contaminated rayons. At the same time, the administrative structures as a whole are operating poorly and not fully implementing the government documents that have been approved. Executive discipline is extremely low, and there is no real control on the part of authorities.

According to the data obtained, 85.0 percent of the experts said that the republic structures are not operating adequately, and 85.8, 79.8, and 78.1 percent respectively said the same thing about oblast, city, and rayon structures. More than half (52.1 percent) of the Gomel and Mogilev respondents surveyed also consider the measures being taken completely ineffective, 30.9 percent consider them more ineffective than effective, and only 2.3 percent are satisfied with the operation of the various levels of administrative structures involved in clearing the consequences of the Chernobyl accident. As the sociological studies have shown, the overwhelming

majority of those surveyed no longer believe that implementation of the programs, laws, and decisions regarding minimizing the accident's consequences will result in any radical change in the current situation. Such was the opinion of 60.5 percent of the experts-specialists.

The situation that has evolved in areas of radioactive contamination provides no real cause for optimism. And indeed how our children grow up depends on us.

Insuring Radiation Safety in Underground Mines

947C0223 Moscow *GORNYY ZHURNAL* in Russian
No. 11, 1993 pp 57-59

[Article by A. Sh. Shegirbayev, A. Zh. Shaykhin, A. K. Sagdenov; UDC 614.8+622.5:539.1:65.016.4]

[Abstract] The issue of insuring radiation safety has been prompted by contamination of mine atmospheres with short-lived products of the decay of radioactive radon and thoron gases that are continuously released from rock and ore. These gases damage the epithelial tissues of the bronchial tubes with subsequent pneumoconiosis, which aggravates the course and development of changes in the lungs caused by silicates. A more removed consequence is lung cancer. Studies showed that the concentrations of radon and thoron exceeded the permissible level by a factor of 1.9. A total of 63% of all studied work areas were contaminated. At one mine, measures taken to reduce radiation exposure reduced radiation pollution of the air by a factor of about two in some shafts and by 12-30% in others. Sources of radiation pollution of the air were isolated and fresh air was pumped into the work site. This was supplemented by continuous monitoring. A radiation safety laboratory has been established. Procedures used for various levels of contamination are described. References 4 (Russian).

Sixtieth Anniversary of the Bashkir Medical Institute

947C0161A Moscow *ZDRAVOOKHRANENIYE ROSSIYSKOY FEDERATSII* in Russian No. 1, 1993
(manuscript received 9 Jan 93) pp 26-28

[Article by F. Kh. Kamilov and M. S. Safin (Ufa); UDC 61:378.661"1932-1992"(470.57)]

[Text] In March 1932, at the request of the Bashkir Autonomous Republic, the RSFSR Sovnarkom [Council of People's Commissars] issued a decree to establish a medical institute in Ufa. The first classes began on 15 November 1932.

The first 5 years of the institute's operation were the most difficult and responsible. In these years all of the structural divisions of the institute were formed—departments, library, public organizations, and the administrative-management service; staff was hired, the material and technical base was established and strengthened, and clinical institutions were assimilated.

In 1938, the first collection of scientific works of the institute was published, and it contained the results of research carried out in clinical and theoretical departments.

In the prewar years (1939-1941), work continued to strengthen the institute's material base, outfit the departments with research and educational equipment, improve organization of learning and educational work, and expand research activities. In this period, a new pleiad of scientists joined the staff: professors S. S. Serebrennikov, V. A. Zhukhin, A. I. Kartamyshev, S. V. Mikhaylovskiy, and A. A. Polyantsev. These were people with formed scientific views and enormous experience in pedagogic work, who made a great contribution to subsequent development of the institute.

By the time the Great Patriotic War began, the institute had trained 1055 physicians. In this time, 14 doctoral and 18 candidatorial dissertations were defended. Publication of scientific works continued: volumes 2, 3 and 4. Annual reporting scientific conferences convened from 1939 on.

During the years of the Great Patriotic War, the institute was faced with a responsible task: to train physicians for the front and rear, provide the wounded and public with highly qualified medical care, aid in preservation of sanitary and epidemiological welfare in the republic. Working conditions were extremely difficult. A significant part of the staff was mobilized, and two hospitals were deployed in the educational building and student dormitory. In 1941, the First Moscow Medical Institute was evacuated to the institute and worked there for 2 school years.

In spite of these difficult conditions, the institute rapidly converted to the requirements of wartime. In this respect, much credit is due to its director, docent G. A. Pandikov. During the war years, 905 physicians were trained; more than 1000 graduates of the institute fought on the fronts of the Great Patriotic War and 63 of them died.

The research activities of the institute were productive, in spite of the difficult conditions. In the war years, volumes 5 and 6 of its scientific works were published, and the annual summary conferences continued to be held.

After the war, the VUZ staff worked actively on development of the material base, refinement of the educational process and restructuring of research activities relevant to peacetime conditions.

In 1957, the institute celebrated its 25th anniversary. In these years it became a major educational and research center in the republic, and played a large part in training physicians and scientific personnel, in improving health care and health of the people in Bashkiria.

The next 25 years were an important period in the history of the institute. To meet the needs of health care

practice, an evening department was opened in the medical department (1961), new departments were created: pediatrics (1961), sanitation and hygiene (1970), stomatology (1976), and pharmaceutics (1981). To improve the quality of medical care, a department for advanced training of physicians was organized (1976) at the institute, which was called upon to upgrade the knowledge of physicians, with consideration of the advances in Soviet and world science. Such a change in the structure and scope of activities made it necessary to expand the material base, accelerate training of scientific and pedagogic personnel, activate vocational guidance among young people. The institute staff succeeded in these tasks.

I should like to note that, in this period, it became necessary to replace administrators of most departments with young and promising scientists. This very delicate and difficult task was assigned to institute management, headed by Z. A. Ikhsanov.

At this stage, with reduction of the list of topics being developed, the scientists directed their efforts toward investigation of the effects of industrial factors on worker health, first of all, in sectors that are very important to our republic: chemical, petrochemical and oil refining industries.

In spite of considerable achievements, in the late 1970s there were slackening tendencies at the institute. While there was an annual increase in student enrollment, the material base and, first of all, the size of dormitories, remained unchanged. Newly opened departments and their divisions were located in poorly equipped premises. In this period, there was considerable decrease in research activity of the institute's staff. For this reason, in the early 1980s institute management paid much attention to development of the material base, which made it possible at this stage to essentially provide needy students with housing, find space for divisions of new departments and improve somewhat housing conditions for the staff. A comprehensive program was developed in this direction for social development of the institute up to the year 2000, implementation of which is a task of paramount importance for the staff.

In this period, rigid requirements were imposed to timely completion of planned research and broader involvement of professorial and instructor staff in research. This led to considerable activation of research activities of the institute. Thus, in 1981-1985 a total of 7 doctoral and 75 candidatorial dissertations were defended, and there were 20 exhibits, with medals award to 6 of them, reflecting the research done in the departments at the Exhibition of Achievements of the National Economy of the USSR. A total of 27 methodological recommendations were published on the RSFSR and USSR level. In this period, there was significant growth in volume of research topics developed on a cost-accounting basis.

The multifaceted educational and rearing work at the VUZ in recent work, has been based on implementation of enforceable enactments to restructure higher specialized education in the country. The main purpose of restructuring the educational process at the VUZ was to train specialists capable of finding correct solutions under the complicated conditions of scientific and technological progress, and to make skillful use in practice of modern achievements of science and technology. Elements of research and educational equipment were actively introduced into the educational process, and there was distinct manifestation of integration of education, science and industry. Thirty-nine of the 65 departments are clinical and located at hospitals, polyclinics, and research institutes. The departments have equal responsibility with management of these institutions for performance and introduction of scientific achievements into practice.

Four educational-research-production associations were formed for the purpose of integrating learning, science and industry: with the Ufa Research Institute of Eye Diseases, Ufa Research Institute of Hygiene and Occupational Diseases, the Pharmacy Production Association and Ufa Vitamin Plant. As a result of such organization of the educational process, there was reinforcement of scientific and professional contact between students and clinical and pharmaceutical bases, with deeper research and industrial orientation of the educational process.

The structure of departments was revised and new ones established—polyclinical medicine, polyclinical pediatrics, neonatology—in order to have more effective restructuring to meet current requirements.

The events of recent years made it necessary to make some serious adjustments in organization of the educational process and joint activities of the institute with health care agencies and institutions. In this regard, a new department was organized, the department of medical disasters, to teach students in all departments the fundamentals of military medicine in the field, military surgery in the field, civil defense and civil defense medical service under wartime and peacetime conditions.

Emergency medical care and disaster medicine, toxicology, occupational pathology, industrial and environmental hygiene subdepartments were organized under the department for advanced training of physicians. These subdepartments were headed by young professors, whose activities were aimed at improving the educational process and organizing research on sociomedical aspects of disasters and accidents involving transport, chemical, petrochemical enterprises and extraordinary ecological situations.

The scientific endeavors of the institute in the last 10 years were formed in accordance with the need for further improvement of public health, and they concentrated on the following main directions: mother and

child care, industrial hygiene and environmental protection, pressing problems of clinical medicine. In this period, the institute staff prepared 37 doctoral and 133 candidatorial dissertations.

In the years of its existence, the institute trained more than 23,000 physicians who are working in all regions of the country; 95 percent of the physicians who work in this republic are graduates of the Bashkir Medical Institute.

In 60 years, 133 doctors and 604 candidates of medical sciences were trained, who head subdepartments and laboratories at medical VUZs and research institutions of the country. At the present time, there are 71 doctors and 333 candidates of medical sciences employed at the institute. Scientific schools were formed in the departments, which deal with problems of clinical and theoretical medicine, and have gained recognition in our country and abroad.

As one looks back at the road traveled and assesses the enormous contribution of prior generations to the inception and development of the institute, it is necessary to mention the difficult and responsible tasks confronting its staff. The material base must be further improved. The system of training scientific personnel, development of research topics relevant to the national economy, and application of research results to practice must be improved. Research related to the ecological situation, improvement of mother and child health care, reduction of incidence of genetic and chronic pathology will be the important types of scientific investigations in the immediate future.

We are faced with the difficult and responsible task of restructuring the educational process. This work will be directed toward predominant training of physicians practicing general medicine, humanization, rebirth and development of progressive traditions in education and culture, and in the lifestyle of the medical intelligentsia.

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Comment on Prof. M.N. Lomako's Article 'Ways of Reorganizing Medical Science in Belarus' (No. 1, 1993, p 77)

947C0168A Minsk ZDRAVOOKHRANENIYE BELARUSI in Russian No. 6, Jun 93 pp 68-69

[Article by P.S. Krivonos, docent, and M.A. Popkovskiy, assistant, Tuberculosis Department, Minsk Medical Institute]

[Text] In addition to the problems of organizing medical science, the author discusses the need for higher-quality training of scientific and medical personnel and for the creation of a single medical training academy.

We believe that the problem of training medical personnel needs to be examined in greater detail. It goes without argument that under market conditions, the

training of medical personnel should be radically reorganized. Life has demonstrated that the system of higher medical education in the former USSR had many shortcomings. The main ones were as follows: no professional selection of youth upon entry into the institute, inadequate quality control of the training of university entrants, benefits upon entry for individual categories, free training, and formal and weak quality control of the training of students during the instructional process. Indeed, when moving from course to course or taking their examinations in several subjects, a student must, in several subjects, answer questions on subjects that are in fact only theoretical, after which he becomes a physician. Unfortunately, the negative principles of this system are still being maintained today, which is having a negative effect on the training of specialists with a higher education. After entering the institute, an entry student quickly becomes convinced that he does not have to exert himself especially. He will surely be passed to the final course, assigned to work, and given a salary, just like everybody. For this reason, not every student is interested in the quality of his training.

The mass stamping of "green" specialists that has come about has led to a quantitative increase in medical higher educational institutions. As a result, a higher educational institution medical megapolis has formed in the republic that our weak economy cannot maintain. At the present time, most of the republic's oblasts have their own medical institutes with a weak financial base and staff, where it is impossible to train qualified physicians. The scattering of experienced specialists and economic resources through small oblast higher educational institutions makes it impossible to furnish medical institutes with adequate equipment and training methods, which has a negative impact on the level of training physicians receive and which makes it impossible for them to be competitive with respect to analogous specialists from economically developed countries. The shortcomings in the training of physicians ultimately affect the quality of training received by the rising generation of scientists.

We see the solution to these problems in the following:

- 1. Unification of medical training institutions into a medical training academy with large head specialized departments and with peripheral affiliates to which professors must periodically travel to deliver lectures and provide consultations on training methods.
- 2. Creation, on the basis of the medical academy, of a single system for initial and postgraduate physician training, which will be possible if the Minsk Medical Institute and Byelorussian Institute for Advanced Training of Physicians are combined.
- 3. Specialization of higher educational institutions with respect to training specialists of a specific profile: internists, dentists, pharmacists, and public health inspectors. This will make it possible for each higher educational institution to work in a more purposeful manner and will thereby improve the quality of training received by students.
- 4. Organization of an advanced training department for educators at higher educational institutions and teachers at regular medical training institutions.
- 5. Gradual phase-in of requiring payment for training of students.
- 6. Radical revision of the system for quality control of training received by students.

Birth Rate in Russia

947C01554 Moscow ZDRAVOOKHRANENIYE
ROSSIYSKOY FEDERATSII in Russian No. 5,
May 93 (manuscript received 12 Feb 93) pp 25-27

[Article by B.P. Bruy and I.A. Korolev; UDC 314.3(470)]

[Text] In recent years Russia has experienced a drop in birth rate so significant that her demographic situation is now characterized as the worst in all postwar years (Table 1).

Table 1. Dynamics of the Birth Rate in Russia

Birth Rate	Years									
	1960	1970	1980	1985	1986	1987	1988	1989	1990	1991
Total no. born, thousands	2,782	1,904	2,203	2,375	2,486	2,500	2,348	2,161	1,989	1,795
Per 1,000 population	23.2	14.6	15.9	16.5	17.2	17.2	16.0	14.6	13.4	12.1

Russia is today experiencing a second decrease in birth rate in recent decades that is the direct result of its first decrease at the end of the 1960s. In 1967-1969 an average of only 1.8 million infants were born each year versus 2.8 million in 1957-1959. This was due to consequences of the low birth rate during the war years. At that time, the total birth rate index (number born per 1,000 population) decreased by nearly half, i.e., from 23.2 per thousand in 1960 to 14.2 per thousand in 1969.

In the seventies, the birth rate increased slightly and remains at a level of 15-16 per thousand. At the beginning of the eighties, the birth rate still increased somewhat after measures aiding families with children were gradually implemented beginning in 1982. Unfortunately, they were taken not in the fall but in the rise of a demographic wave, when the birth rate would have increased anyway. This led to an artificial increase in the last birth rate peak.

Unlike in other regions of the former USSR, in Russia the increase in birth rate during this period was linked primarily to a change in planned times between the birth of children in families rather than to a revision of the number planned. In other words, there was a mass ahead-of-schedule realization of reproductive plans of a whole series of generations of women. Most of them are now still fertile (15 to 49 years old); however, they are not taking part in reproduction of the population.

A second factor objectively causing a decrease in the number of births is the small contingents of women born in the second half of the sixties and beginning of the seventies (i.e., the daughters of those born in the war and initial postwar years) who are now entering their years of greatest fertility (20 to 29 years). And they are the ones who account for two-thirds of the children born each year. Since 1987, the number of women in this age group has decreased by 1.7 million (14 percent). This includes a decrease of 171,000 (2 percent) in the past year.

The decrease in birth rate would not be so critical, however, if it were not affected by the overall crisis situation in the socioeconomic sector coupled with the political instability and threat of the spread of interethnic conflict in isolated regions. The decrease in the population's standard of living and uncertainty about tomorrow are being manifested in a decrease in the frequency of childbearing. A special birth rate coefficient (number of infants born per 1,000 women aged 15 to 49 years) decreased by 18.5 points, i.e., from 68.4 in 1987 to 49.9 in 1991. More than 90 percent of the absolute magnitude of this decrease consisted of losses as a result of the intensity of births, especially among women aged 25 to 34 years, whose fertility level largely determines the situation regarding the birth rate. Already having had 1 or 2 children, they are refraining from giving birth to any more under the current conditions. In 1991 the total number of infants born in Russia was 705,000 (29 percent) fewer than in 1987, and the number of second and third children born to mothers in the specified age group was down by 389,000 (46 percent) (Table 2).

Table 2. No. Born Per 1,000 Women of Various Ages

Age, years	Total		Including by birth order					
	1987	1991	First Child		Second Child		Third Child	
			1987	1991	1987	1991	1987	1991
Under 20	48.7	54.9	44.7	50.8	3.8	2.8	0.2	0.1
20-24	172.5	146.6	107.0	100.9	56.9	39.3	7.3	5.2
25-29	122.2	83.0	31.2	25.5	66.6	39.7	18.2	11.2
30-34	67.7	41.6	9.7	8.5	31.8	17.7	17.1	9.3
35-39	27.8	16.5	3.5	2.9	9.7	5.2	7.8	4.0
40-44	6.2	3.7	0.8	0.6	1.5	0.8	1.5	0.8
45-49	0.2	0.2	0.0	0.0	0.0	0.0	0.1	0.0

In 1987 the percentage of repeat births in the total number of births reached nearly 60 percent, whereas in 1991 it only amounted to 48 percent.

The current decrease in birth rate in Russia has encompassed all regions of the country, intensifying the birth rate differences among territories even more (Table 3).

Table 3. Birth Rate in Different Territories of Russia

No. Born Per 1,000 Population	No. Territories				
	1987	1988	1989	1990	1991
Less than 10	-	-	-	-	6
10.0-11.9	-	-	3	17	33
12.0-13.9	2	15	27	29	21
14.0-15.9	24	23	24	18	8
16.0-17.9	20	19	12	5	2
18.0 or more	31	20	11	8	7

A relatively high total birth rate coefficient is now only being maintained in those regions of Russia where having many children has traditionally been popular: in Dagestan (25.4 born per 1,000 population), Checheno-Ingushetia (24.1), Tuva (23.7), Kalmykia (19.4), Kabardino-Balkaria (19.1), Altay (18.1), and Yakutia (Sakha) (18.0). Only in these territories and in Buryatia is reproduction of the population occurring, i.e., each new contingent of infants born is numerically greater than the contingent of their parents. In all other regions and throughout the country as a whole, the birth rate is not even resulting in simple reproduction of the population.

The situation has become especially bad in cities. Given the current level of age-by-age mortality, simple replacement of a generation of parents by their children requires that each woman give birth to at least 2.15-2.17 children during her lifetime. Among city dwellers, the figure only amounts to 1.54. It is 1.24 in the Moscow Oblast, 1.25 in Saint Petersburg, 1.29 in Moscow, 1.39 in the Yaroslavl and Murmansk oblasts, 1.42 in the Tula Oblast, 1.43 in the Ivanovo Oblast, 1.44 in the Vladimir Oblast, 1.45 in the Smolensk and Orlov oblasts, and 1.48 in the Ryazan Oblast.

The total birth rate coefficient in rural areas is 1.5 times higher than in urban areas and amounts to 2.38 births. At the same time, in 28 territories located primarily in the European part of the country, simple reproduction of the population is not even taking place. In addition, in view of the age-sex disproportions that have resulted from the multiyear migration of youths to cities, the total number of births in the country is relatively low. Women of fertile age (15 to 49 years) constitute 38.6 percent of all rural women versus 48.2 percent of urban women, and in most oblasts of the Central and Central-Chernozem rayons they do not constitute more than 32-38 percent.

The conscious limitation of the birth rate in recent years has even more sharply exacerbated one of Russia's burning social problems, i.e., the great number of abortions inflicting irreparable harm to the health of women and their future children. Under the conditions of the country's acute shortage of effective contraceptives, abortion remains the most popular means of terminating pregnancy. According to data from the Russian Federation Ministry of Health, 3.6 million abortions, i.e., nearly twice the number of births, were recorded in 1991. There are 100 abortions for every 1,000 women of fertile age. This is the highest ratio among the CIS countries. More than 4,000 abortions were performed on females under the age of 15, and 250,000 were performed on females aged 15 to 19 years. Of those amounts, 3,000 (75 percent) and 84,000 (34 percent), respectively, were performed on women who were pregnant for the first time. Abortions during a first pregnancy have a significant effect on the birth rate inasmuch as a significant number of young women resorting to them remain infertile in the future.

The extensive popularity of abortions, low culture of reproductive behavior of most of Russia's population, weak preventive work among young unmarried girls, shortcomings of medical service, and adverse work conditions of many women have had a pernicious effect on the health of pregnant women. In 1991, the most serious and most frequently encountered diseases were anemia, toxicosis, and diseases of the genitourinary system and circulatory organs. They caused complications during birth and in the postnatal period in nearly 900,000 women, which is to say in about half. In 1987-1991 the number of cases of anemia increased by a factor of 2.5, those with complications of the genitourinary system doubled, and those with complications of the circulatory system increased by 25 percent. The most frequent pathology of pregnancy, i.e., gestosis, increased by 20 percent. In this regard, an increase in pathological births is becoming inevitable. Their relative percentage has increased from 46 percent in 1987 to 54 percent in 1992.

Total neonate morbidity has increased: In 1985 every 11th infant in Russia was either born ill or became ill versus every 8th in 1989, every 7th in 1990, and every 6th in 1991. Among those neonatal diseases that are most serious from a survival standpoint, the frequency of congenital anomalies increased (by 37 percent) and

respiratory distress syndrome due to respiratory organ immaturity increased (by 32 percent) in 1987-1991.

This unprecedented rate of decrease in the birth rate in the country is occurring against the background of high infant mortality, the level of which has increased from 17.4 per 1,000 infants born in 1990 to 17.8 in 1991. The coefficient has increased to 32 in Tuva and Checheno-Ingushtia, to 23 in Altay, and to 21 in Dagestan, Buryatia, Yakutia, and the Krasnodar Kray. In the developed countries of Europe, the United States, Canada, Australia, and Japan, the death rate of infants during their first year of life ranges from 5 to 9 per 1,000 infants born, i.e., it is one-fourth to one-half the average throughout Russia. In the Baltic countries, Ukraine, and Belarus it is 11-15, i.e., 1.3 to 1.7 times lower.

It is our opinion that, at the present time, when an increase in birth rate cannot be counted on, decreasing infant mortality, maintaining the life and health of low-weight and premature babies, and reducing the number of abortions should become the main priorities in forming demographic policy in the area of birth rate.

In many cases, the skyrocketing increase in the cost of life and sharp increase in the costs of maintaining even one child impose a heavy economic burden on the family: As of the beginning of September 1992, the minimum cost in Moscow of assembling the things needed for an infant under the age of 3 months amounted to 17,000 rubles as opposed to 10,000 rubles in March. This equals nearly 19 minimum wages, whereas the benefits in connection with the birth of a child amount to 2,700 rubles, i.e., 3 minimum wages. This money can only buy a baby carriage (2,275 rubles) and one half-woolen blanket (475 rubles). Even given the fact that prices have increased many times over, however, a significant number of goods for newborns remain in short supply. Even in the capital's Detskiy Mir [Child's World], there are no baby carriages, baby bathtubs, baby soap, cream, or baby food warmers, etc., and the drug stores do not always have cotton and gauze. Domestically produced disposable diapers have disappeared from the stores everywhere, and the high-quality imported ones are sold at the unacceptable price of 3,500 rubles for 64. The cost of baby food is very high too.

All of this has, to a large extent, caused a conscious limitation of the birth rate. In just 8 months of 1992, the number of infants born decreased by nearly 150,000 (12 percent) compared with the corresponding period in 1991, and it is anticipated that the decrease for the entire year will be at least 200,000 (12 percent). The total number of infants born in 1992 amounts to just 1.6 million, and the birth rate coefficient had decreased to the unprecedented level of 10.6 infants born per 1,000 population. In Saint Petersburg and Moscow and in the Moscow, Murmansk, Leningrad, Tver, and Tula oblasts this indicator does not exceed 8-9. The negative dynamics of the birth rate had dictated a subsequent decrease in the natural growth that had for many years been the main factor in the growth of the population's

size. Furthermore, since November 1991, there has been a natural decrease throughout Russia as a whole. The number of individuals who died in January-August 1992 exceeded the number of individuals born by 72,000 (6 percent). This process is observed in 41 territories where two-thirds of all of the Russian Federation's inhabitants live. In the Tula Oblast, 1.8 times more people died than were born. In the Tver and Pskov oblasts, 1.7 times more people died than were born. In Moscow and the Yaroslavl, Moscow, Ivanovo, and Novgorod oblasts, 1.6 times more people died than were born, and in the Tambov, Ryazan, Kursk, Leningrad, and Kostroma oblasts, 1.5 times more people died than were born.

According to prognostic estimates, the country's demographic development, at least to the end of the century, will be dictated by the current trends of a decrease in the birth rate and an increase in the death rate. In this event, stable depopulation may begin in Russia by as early as the end of the century. Given an annual natural decrease of 200,000 persons, Russia's population will be reduced by about 1.5 million (or almost by 1 percent) by 1999 and will amount to slightly more than 147 million persons.

Further changes in the processes of the birth rate will largely depend on the duration of the crisis currently being experienced in Russia. In the event of a long-drawn-out crisis, a portion of potential births may not be actualized at all. Mass reassessment by the population of the norms regarding the number of children where the single-child family becomes the dominant family type is also possible.

The transformation of the demographic situation in Russia from adverse to one of extreme crisis has dictated the necessity of development and implementation on a government scale of measures to stabilize demographic development. Under the conditions of a severe budget deficit, measures in relation to the birth rate must be of a predominantly compensatory nature, cushioning the effect of the socioeconomic crisis on families with children. It would be erroneous to concentrate attention primarily on families with many children. What seems feasible is concentration on families constituting the majority in Russia, i.e., on one- and two-child families. Among them, the least socially protected young families should be designated a priority group because the future reproduction of Russia's population is most directly dependent on the number of children they have.

We are proposing that such measures should provide for the following: restructuring of the system of medical assistance to the population, especially to pregnant women and mothers with children; increasing one-time and continuous grants for bearing children; paying for leaves to care for children; providing preferential loans and residential and other support to young families with children; improving the system of preschool and school education; and providing scarce children's goods to families with children.

For additional financing of these measures, it would be advisable to create a Russian Population Fund. Other sources for it, besides government deductions, could be funds from enterprises and domestic and foreign sponsors subjected to preferential taxation.

Specialist Comments on Organ Donation Law

947C02634 Moscow *IZVESTIYA* in Russian 5 Feb 94 p 6

[Excerpt from an unattributed untitled article under the "Specialists' Viewpoint" rubric]

[Excerpt] Detailed and clear-cut instructions exist in the rules for determining brain death. Only when they are carried out in their entirety, emphasizes Professor Aleksandr Gurvich, can physicians specializing in reanimation and neuropathologists (transplantologist involvement is categorically prohibited) conclude with certainty that the dying process is irreversible. The physicians conducting the treatment process bear total responsibility for the conclusion. In 1985 our Ministry of Health approved the first suitable instructions. Together with Gurvich and Popova, the academician of medicine Negovskiy became one of the authors of our instructions regarding brain death. While sharing all its principles, he attributes great significance to preservation of the brain's cognitive properties.

The instructions assume impeccable exactitude of execution and excellent qualifications and high ethical principles on the part of physicians. Professor Lyubov Popova believes that our recently issued law "Concerning Transplantation of Human Organs and Tissues" suffers from serious flaws. Specifically, it states that removal of a deceased person's organs for transplantation is possible if he made no objections to it during his lifetime and if his relatives make no objections after his death. But the professor says that while alive, the deceased may not have known or thought about how his body would be handled after death. Lyubov Popova believes that before the law "Concerning Transplantation of Human Organs and Tissues" is passed, a law regarding brain death must be passed, as is being done in many countries throughout the world. Professor Aleksandr Gurvich is convinced that the law regarding organ and tissue transplantation cannot become a powerful barrier against illegality. In reality, a physician's accountability for violation of the instructions for establishing death are not even specifically spelled out.

Will we really be able to protect human rights and dignity during life and after death? A recent random check of the removal of organs for transplantation in several of the capital's clinics revealed that violations of the instructions were permitted in half of all cases. That is more than an alarm signal.

Negotiations on Settlement of Ethnic-Political Regional Conflict

947C0201A Moscow PSIKHOLOGICHESKIY ZHURNAL in Russian Vol.58 No. 8, Aug 93 pp 16-22

[Article by V.A. Sosnin]

[Abstract] Official negotiations to settle the conflict between the Ingush Republic and the Republic of North Ossetia were held in January-March 1993 in Kislovodsk. The author of this article participated in the negotiations as an observer and made a series of observations regarding their organization, procedures, and process and proceeded to develop a series of recommendations for improving the organization, procedures, and process of similar negotiations in the future. First, he emphasized the potential pitfalls of face-to-face talks between opposing sides in the conflict, including intensification of unconscious distortions in perceiving information about one another, intensification of adversarial attitudes toward and suspicion of the other party, and formation/fixation of an orientation toward achieving victory over the other party at any cost. He noted the great value of having a neutral third party present during face-to-face negotiations and stated that such an arrangement is the best instrument given the current sociopolitical situation within the framework of the CIS and Russian Federation in particular. Next, he pointed out the following typical psychological problems that arose during the negotiations: differing between needs and interests on the one hand and principles and desires on the other hand, being influenced by the history of the interrelations between the conflicting parties, stereotyping and dehumanizing the other side, concentrating on the "worst-case scenario," and distinguishing between parties' policies as expressed in their actions from their declared policies. On the basis of these observations, the psychologist/author offered the following recommendations for future negotiations involving a third party and geared toward controlling conflicts: 1. First, select the team of intermediaries in advance, spell out their functions clearly, and work out a strategy for them to follow;

2. ensure that all parties with an interest in the conflict participate;

3. resolve the question of financing of the negotiations in advance;

4. work with each potential participant to ensure the safety of the negotiations and to make certain that the parties are fundamentally willing to participate, agree as to the time and place of the negotiations and topics to be discussed, and agree on possible drafts of documents to be drawn up in advance by a team of experts;

5. have an official intermediary hold preliminary consultations to work out the process of the negotiations.

Ultrasonic Treatment of Infected Biological Tissues

947C0153A Moscow MEDITSINSKAYA RADILOGIYA in Russian Vol. 37 No. 7-8, Jul-Aug 92 pp 27-33

[Article by E.Ya. Dubrov, V.G. Vedenkov, S.M. Volkov, A.A. Orlova, Scientific Research Institute of First Aid imeni N.V. Sklifosovskiy and Moscow State Engineering University imeni N.E. Bauman; UDC 617-001.4-022-085.837.3]

[Abstract] The history of ultrasonic treatment development is outlined and the theoretical and experimental principles of the methods are discussed. It is noted that the prerequisites of realizing the method are that there be a liquid phase and the solution be a good conductor of ultrasonic vibrations. A schematic diagram of the ultrasonic biological tissue treatment process and a block diagram of the kinetics of therapeutic processes in the wound under the effect of ultrasonic vibrations are cited, and the effect of acoustic and process parameters on the duration of removing necrotic infected layers from the soft and osseous biological tissue surface, the kinetics of biological tissue penetration by drugs, and the effect of acoustic and process parameters on the depth of biological tissue penetration by drugs are plotted. The stability of certain types of bacteria to ultrasonic exposure in various media is summarized. Clinical trials of ultrasonic sanitization of wounds in more than a thousand patients reveal the absence of any types of general or local changes in the adjacent biological tissues; surgery area and traumatic wound treatment in an antibiotic or antiseptic medium rules out the development of local infection and accelerates the tissue recovery while the process itself is free of complications. Ultrasonic treatment has an anesthetic effect while the proposed method and equipment are simple, making it possible to treat biological tissues in any spot, both under clinical and ambulatory conditions. Figures 8; tables 2; references 5.

Reproductive Complications in Men Engaged in Chernobyl Cleanup

947C143A Moscow MEDITSINA TRUDA I PROMYSHLENNAYA EKOLOGIYA in Russian No. 3-4, Mar-Apr 93 (manuscript received 30 Apr 92) pp 25-26

[Article by V.V. Yevdokimov, V.I. Yerasova, A.I. Demin, Ye.B. Dubinina and P.N. Lyubchenko, Institute of Urology, Ministry of Health, Russian Federation; Moscow Oblast Clinical Research Institute imeni M.F. Vladimirskei, Moscow]

[Abstract] Reproductive follow-up studies were conducted on 164 men that had been engaged in cleanup efforts at the Chernobyl nuclear power plant. External exposure levels of these 22-50 year old men were reported not to have exceeded 25 cGy. The protocols involved questionnaires and, in the case of 125 of the men, laboratory examinations of semen samples. The

findings indicated that one third of the men suffered from various degrees of impotence. In addition, 21% presented with chronic prostatovesiculitis, azoospermia, oligozoospermia, or asthenospermia. Thus, impotence and infertility should also be included on the list of medical complications that are being monitored in the Chernobyl cleanup personnel. Tables 1; references: 2 (Russian).

PHARMACOLOGY AND PHYSIOLOGY

Synthesis and Anticholinesterase Activity of Fluorine-Containing α -Aminophosphoryl Compounds

947C0201A Moscow

KHIMIKO-FARMATSEVTICHESKIY ZHURNAL
in Russian Vol.26 No. 6, Jun 92 pp 21-23

[Article by O.V. Korenchenko, Yu.Ya. Ivanov, A.Yu. Aksinenko, V.B. Sokolov, and I.V. Martynov, Institute of Physiologically Active Substances, USSR Academy of Sciences, Chernogolovka; UDC 615.217.32.012.1.07]

[Abstract] A total of 12 fluorine-containing α -aminophosphoryl compounds with the formula ' $p(O)C(F_3)_2NHC(O)R^2$ ' and with various alkoxy and alkyl radicals were synthesized. The first ten compounds were produced by reacting the respective hydrophosphoryl compounds with carbonylimines of hexafluoroacetone. Compounds 11 and 12 were obtained by reacting 1,4,2-oxazaphospholine with alcohol. The new compounds' biological activity was estimated by their effect on acetylcholinesterase and butyrylcholinesterase, as well as by their effect on neuromuscular conduction and their acute toxic effect on mice. Their 1H , ^{19}F , and ^{31}P NMR spectra were recorded on a spectrometer manufactured by Bruker (Germany) in a $CDCl_3$ solution. The effectiveness of the new compounds as acetylcholinesterase inhibitors depended on the structure of the substituent of the carbamate part of the molecule. As R^2 increased from a propoxyl to an isoamylxoyl substituent, inhibition activity decreased in relation to both enzymes studied. The new compounds inhibited acetylcholinesterase activity at rates ranging from 1.7×10^1 to 7.0×10^6 /mol/min and butyrylcholinesterase activity at rates ranging from 4.6×10^2 to 2.5×10^6 /mol/min. Of all the newly synthesized compounds, compounds 11 and 12 were the best acetylcholinesterase inhibitors (with respective irreversible inhibition rate constants of 7.0×10^6 and 1.0×10^6 /mol/min). In concentrations of 1×10^{-6} M, compounds 11 and 12 intensified the contractions of an isolated diaphragm in response to stimulation of the nerve by sparse (0.1 Hz) single pulses. They also caused fasciculations, a pessimal reaction to tetanization, and a sharp increase in sensitivity to the blocking effect of acetylcholine. TMB-4 (in the amount of 1×10^{-5} M) improved the muscle's ability to withstand tetanus. All of these signs indicated that the blocking activity of the two compounds was based on an anticholinesterase

mechanism. Compound 11, i.e., α -butyl-1-(ethoxycarbonyl)amino(perfluoro-1-methylethyl)methylphosphoninate, was determined to have a lethal concentration (LD_{50}) of 75 (58-97) mg/kg. The other compounds' LD_{50} was not found because of the atyp of the dose-effect dependence. Tables 3; references 9: 5 Russian; 4 Western.

Sensitivity of Laboratory Animals and Guppies to T-2 Toxin *Fusarium sporotrichiella* Bilai

947C0104A Moscow MIKOLOGIYA 1

FITOPATOLOGIYA in Russian Vol. 27 No. 2, Feb 93
(manuscript received 28 Jul 92) pp 32-37

[Article by V.V. Rukhlyada and V.A. Trufanova, Belotserkov Agricultural Institute, Ukraine Poultry Farming Scientific Research Institute; UDC 582.288.45: 576.8.097.29]

[Abstract] A study examined the sensitivity of albino mice, rats, rabbits, and guppies to T-2 toxin obtained from the fungus *Fusarium sporotrichiella* 421 isolated from postharvest barley residues that caused T-2 toxicosis in sheep. The toxin was obtained by culturing *F. sporotrichiella* on sterile corn and barley grains with 50 percent moisture for 2 weeks at room temperature and then for 1 month at 4-6°C. The *Fusarium* toxin was then extracted by a 4:1 chloroform-acetone mixture, and the T-2 toxin was purified by adsorption column chromatography. Seven different concentrations of toxin (ranging from 0.006 to 0.4 μ g/ml water) were tested on the rabbits to determine the minimum amount of toxin causing a skin reaction, and seven different concentrations (ranging from 0.01 to 0.12 μ g/ml water) were tested on the guppies. Twenty fish were used to test each concentration in two tests, with lethality calculated after 24 hours and the lethal concentration calculated according to the Pershin method. In the case of the mice and rats, the T-2 toxin was dissolved in ethanol and then further diluted with distilled water to obtain a 10 percent concentration of ethanol. The toxin was administered to the mice via intraperitoneal injection and orally, the rats received the toxin orally, and the rabbits were given bolus injections of toxin. The following skin reactions developed in the rabbits after the toxin was applied to their skin in various doses: mild hyperemia after day 1 that intensified on day 2 after application of 0.025 μ g/spot or more; short-term, rapidly developing reddening after a dose of 0.012 μ g toxin; and pronounced hyperemia followed by necrosis after doses of 0.05 μ g or more. In the case of the guppies, doses of more than 0.02 μ g/ml water proved fatal, and the median lethal concentration (LD_{50}) of T-2 toxin was calculated to be 0.06 μ g/ml. The LD_{50} values calculated for the various laboratory animals and administration routes were as follows (mg/kg): 2.55, 3.1, and 5 for albino mice respectively receiving the T-2 toxin subcutaneously, intraperitoneally, and orally; 3.9 for albino rats receiving the T-2 orally; and 2.53 for rabbits receiving the T-2 orally. The results obtained in this set of experiments thus generally coincided with the data obtained by Russian, American,

and Finnish researchers. T-2 was concluded to be one of the most toxic fungus metabolites, lagging behind only rubratoxin and aflatoxin. All of the animals studied, i.e., guppies, rabbits, albino mice, and albino rats, were deemed suitable for use as biological test objects for use in detecting T-2 toxin. Tables 5; references 19: 8 Russian, 11 Western.

Radiation Protection Properties of [Aminoalkyl] Aryltetrazoles

947C0214A Moscow KHIMIKO
FARMATSEVTICHESKIY ZHURNAL in Russian
No.3, Mar 93 pp 33-36

[Article by V.G. Kitayeva, R.I. Ishmetova, G.L. Rusinov, R.M. Malkina, Ye.I. Tolstykh and T.N. Tuzhilikova (deceased) (Fine Organic Synthesis Department, IOKh [Organic Chemistry Institute], Ur [Ural Department], RAN [Russian Academy of Sciences], Yekaterinburg; Biophysics Institute, RF [Russian Federation] MZ [expansion not given], Moscow); received May 26, 1992; UDC 615.31:547.796.1

[Abstract] Earlier the authors had synthesized new biologically active tetrazole derivatives that turned out to have radiation protection properties. Continuing their search among tetrazole derivatives for new radiation protectors the authors obtained 27 different (2) aminoalkyl 5 substituted aryltetrazoles identified as IXX-VII. Their properties are presented. Also presented are toxic and radiation protection properties for N_2 isomers and their salts. Nine derivatives exhibited a 40-80% radiation effect under an $LD_{05/99/30}$ exposure. A relationship between their structure and action was observed. The most detailed study of radiation protection properties was conducted for compound XIV. It maintains its protection properties for 3 hours after exposure. Chemical and biological experiments were performed. The obtained data indicate that tetrazole class is promising in a search for radiation protectors. Tables 4, references 9.

LASER AND NONIONIZING RADIATION

Twofold Resonant Effect of Modulated Millimetric Waves on Motor Activity of Unicellular *Paramecium Caudatum* Protozoans

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[Abstract] An experimental study was made concerning the effect of short-wave electromagnetic radiation on the balance of calcium ions in animal cells and the possibility of enhancing the effect of such a radiation by its effect by infralow-frequency modulation. Tests were performed on unicellular *Paramecium Caudatum* protozoans, their motor activity being known to depend on the concentration of calcium ions. Ten tests were performed with continuous 42.2 GHz radiation, its power being varied from several microwatts to tens of milliwatts. No change of the mobility index was recorded in this experiment. Twenty tests were performed with pulse modulation of the 42.2 GHz carrier independently by 16 Hz, 1 Hz, 0.5 Hz, 0.25 Hz, 0.05 Hz meander signals and with the incident carrier power varied over the 0.1-20 mW/cm^2 range. In this experiment a change of the mobility index, a very small one, was recorded only upon incidence of a 0.1 mW/cm^2 radiation power pulse-modulated by an about 0.1 Hz meander signals. The data from this experiment closely approximate a normal Gauss-Laplace distribution, with an $\Delta f_{mod}/f_{mod} = 0.05$ ratio. Accordingly, only modulation within a 0.005 Hz wide frequency band has an effect on the mobility, this effect being strongest when the modulation frequency is 0.095 Hz. In a third experiment the carrier frequency of incident radiation was varied over the 42.0-42.5 GHz range while the modulation frequency was held constant at 0.095 Hz, the radiation power having in this case being raised to 10 mW/cm^2 so as eliminate likely uncontrollable power fluctuations during the carrier-frequency sweep. The data from this experiment also closely approximate a normal Gauss-Laplace distribution, an effect on the mobility occurring within an only 200 MHz wide range of carrier frequency with a maximum at 42.25 GHz. The dependence of this effect on the carrier frequency as well as on the modulation frequency was thus found to be characterized by resonance. These results do not the well known thermal theory regarding biological objects. Rather, as direct temperature measurements have confirmed, the effect of exposure to short-wave radiation involves resonant or at least quasi-resonant energy absorption and the dependence of its magnitude on the radiation power density is characterized by existence of an about 50 mW/cm^2 threshold. Indeed, the specimen temperature remained the same (within 0.1°C) upon exposure to 1 mW/cm^2 radiation and direct heating by modulated infrared radiation to a 1-1.5°C higher temperature did not decrease the mobility index. It therefore appears that short-wave radiation modulated at a specific infralow frequency may either influence or actually cause oscillations of the intracellular calcium content, the period of such oscillations being known to vary over the 5-100 s range. It still remains difficult to explain why the frequency range of effect-enhancing modulation is so narrow. Article was submitted by Academician A.A. Bayev on 7 Jun 93. Figures 2; references 13.

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